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ABSTRACT

The 1990 U.S. Department of Labor Survey (DOL) of Workplace Literacy (WL) assessed the WL levels of applicants eligible for Job Training Partnership Act (JTPA) training and of job seekers in Employment Service/Unemployment Insurance (ES/UI) programs. Data from the survey, including WL proficiency scores and data concerning respondents' socioeconomic and personal characteristics were analyzed to determine the relationship between the WL and labor market performance of unemployed workers in job training and employment programs. WL was determined to play a critical role in determining the labor market experience of the DOL client populations and was significantly correlated with hourly wages and with weeks worked in a 1-year period. Schooling was by far the most important determinant of WL; however, literacy-related activities at home and work also proved significant determinants of WL. Recommendations included calls for including WL learning gains in performance standards used to evaluate individual job training programs; considering individuals' level of WL when matching them to training programs/jobs, and incorporating WL as an integral component of job training. (Twenty-five tables/figures are included/appended. Contains 23 references.) (MN)

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Workplace Literacy And the Nation's Unemployed Workers

Research and Evaluation Report Series 93-F

U.S. Department of Labor
Employment and Training Administration
1993

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Workplace Literacy And the Nation's Unemployed Workers

Research and Evaluation Report Series 93-F

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Employment and Training Administration
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Office of Strategic Planning and Policy Development
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1993

RESEARCH AND EVALUATION REPORT SERIES

The Research and Evaluation Report Series presents information about and results of projects funded by the Office of Strategic Planning and Policy Development (OSPPD) of the Department of Labor's Employment and Training Administration. These projects deal with a wide range of training, employment, workplace literacy, labor market, and related issues. The series is published under the direction of OSPPD's Dissemination Unit.

This report in the series was prepared by Mamoru Ishikawa, an economist with OSPPD's Division of Research and Demonstration.

Department of Labor staff members conducting research are encouraged to express their own judgment freely. Therefore, this publication does not necessarily represent the official opinion or policy of the Department.

PREFACE

The 1990 workplace-literacy assessment of unemployed workers eligible for participation in the Job Training Partnership Act (JTPA), Employment Service, or Unemployment Insurance program amassed a wealth of information on these workers' literacy status and related characteristics. The data collected can be used to analyze a number of issues regarding literacy and its relationship to various socio-economic conditions of these workers.

This study is intended to complement the studies that have already been made using the survey data, and it focuses on the issue of the labor market experience of unemployed workers in these Department of Labor programs. It first addresses the question of how relevant workplace literacy -- measured in terms of prose comprehension, document literacy, and quantitative literacy -- is to the past economic performance of these workers. Then, the study tries to answer the question of what determines the workplace literacy of individuals. From its analysis of these questions, the study draws policy inferences regarding employment and training programs, especially in terms of the way the nation's unemployed workers can be helped to improve their productivity and employment stability.

Through the course of this study, the author benefited from discussions with a number of colleagues -- including Greg Duncan, David Finifter, Jules Goodison, Jerry Gundersen, Joe Hight, Arnold Katz, Irwin Kirsch, Dan Ryan, and Kentaro Yamamoto. The author's heartfelt thanks are also due to Kim Baker for his thorough and patient editorial assistance.

Needless to say, the views expressed in the study are the author's own and do not necessarily reflect the official position of the U.S. Department of Labor.

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EXECUTIVE SUMMARY

The 1990 Department of Labor Survey of Workplace Literacy assessed the workplace literacy levels of eligible applicants for JTPA training and of jobseekers in the Employment Service/Unemployment Insurance programs. Using the survey data, which included workplace-literacy proficiency scores and data concerning various socio-economic and personal characteristics of the respondents, this study analyzed the relationship between the workplace literacy and labor market performance of the unemployed workers in these programs on one hand and the determinants of workplace literacy on the other.

The central focus of the DOL survey was workplace literacy, which emphasizes the use of literacy skills in actual workplaces. Thus, the relevant skills are the individual's critical thinking and information processing abilities which subsume skills in the three R's.

Three facets of workplace literacy were measured by the proficiency scores obtained from the assessment test in the survey -- prose comprehension, document literacy, and quantitative literacy. (See Appendix Tables A-1-3(a) through (c) for a description of these literacy scales.) Prose comprehension is defined as "the knowledge and skills associated with understanding and using information from texts such as editorials, newspaper articles, stories, poems, and the like." Document literacy is defined as "the knowledge and skills associated with locating and using information in tables, charts, graphs, maps, indexes, and so forth." Quantitative literacy is defined as "the knowledge and skills associated with performing different arithmetic operations, either alone or sequentially, using information embedded in both prose and document materials." (See Irwin Kirsch, et al., Beyond the School Doors.)

The purpose of the present study was twofold -- to evaluate the effect of workplace literacy on the labor-market performance of the unemployed workers in the study populations and to identify the determinants of workplace literacy. The analytical findings led to a number of human resource policy implications, which are highlighted as follows:

1. Workplace literacy plays a critical role in determining the labor market experience of the workers in these DOL client populations. The present study has found that workplace literacy is significantly correlated with hourly wages, within either the JTPA or ES/UI population. It has also found that workplace literacy is highly correlated with weeks worked in a one-year period in the JTPA population and among ES/UI jobseekers who worked less than 52 weeks in a year.

2. It is reasonable to extend these findings to the general population of workers to say that workplace literacy has a positive impact on their hourly wages. Such effect may be an increase in worker productivity or a relative advantage in the labor market of workers with enhanced levels of workplace literacy. Because of the downward bias in the estimated effects of workplace literacy in this study, it is very likely that such an impact is actually greater than the present study indicates.

3. There is an urgent need for workplace-literacy training to be made an integral part of job training. This is attested to by the large proportion of the unemployed workers in the study populations at literacy levels inadequate to perform at the workplace and, moreover, by a substantial amount of high school graduates (and of those with a GED) at these low levels of literacy. The need for improved workplace-literacy levels of the workers is real when rapid changes in technology and the market make it imperative for workers to be equipped with adjustability and with the creativity made possible by their critical thinking capabilities. Such training in the creation of "transportable skills" is an investment in intangible social overhead. In that sense, workplace-literacy training is a proper arena of government activities.

4. As a whole, workplace literacy did not have much impact on the employment experience (measured by the number of weeks worked in a one-year period) of ES/UI jobseekers. However, it did on those who worked less than a full 52 weeks. Given that 30 percent of ES/UI jobseekers had worked a full 52 weeks in a year, this finding suggests a need for a targeted workplace-literacy training policy for those ES/UI jobseekers who are characterized by irregular past employment. This is sensible because the ES/UI population is very heterogeneous. A substantial part of ES/UI jobseekers are regularly-employed workers on a temporary lay-off, and their needs are very different from another segment of ES/UI program participants who, when they work, are employed irregularly either voluntarily or involuntarily and are comprised, to a large extent, of contingent workers, disadvantaged workers, new entrants, and re-entrants.

5. The white-black or white-Hispanic gap in economic well-being may be reduced considerably by workplace literacy improvements among minority workers. This is supported by the large ethnic differences in wages and employment being accounted for, to a large degree, by the effects of workplace literacy. Nevertheless, it is important to note that the remaining gaps are large, indicating other sources of wage and employment differences.

6. A substantial part of the differences in wages and employment due to differences in occupation is explained by differences in the literacy content of jobs. This indicates that the greater the complexity of specific job skills, the higher the general skills (workplace literacy) associated with it. Thus, job training at all levels needs to be accompanied by a corresponding investment in workplace-literacy skills.

7. The present analysis found that, independent of the effects of workplace literacy, there is a strong relationship between attainment of a high school diploma (or GED) and labor market achievement. This seems to indicate that, aside from the substance of learning as represented by literacy proficiency score, there is an economic return to the experience of going through schooling (i.e. the "process" of learning). In other words, a diploma or GED makes a difference in finding jobs and attaining high wages reflecting the so-called credentialling effect or the individual's motivation and tenacity.

8. Given that workplace literacy is an important determinant of the labor market achievement, hence economic well-being, of the unemployed workers in the two DOL client populations, an analysis of the determinants of workplace literacy gives us some

clues as to what can be done to improve the workplace-literacy levels of unemployed workers. Among them, this study has found:

(a) Schooling is by far the most important determinant of workplace literacy, which is not surprising since basic skill in the three R's is a fundamental tool in acquiring and polishing the critical thinking and information processing abilities. This outcome is a reminder that skills in basic reading, writing, and arithmetic are the foundation on which to build workplace-literacy skills.

(b) Literacy-related activities at home and work have a positive impact on literacy proficiency. For example, the use of literacy skills in reading newspapers and in reading and writing memos and articles are closely related to literacy proficiency. While causality runs in both directions, this result points to the importance of sharpening one's workplace-literacy skills through use. Also, it seems to imply that contextual literacy training in conjunction with specific job training, as is done in some high school and youth apprenticeship programs, is an efficient method.

(c) The significant positive relationship between the awareness of one's level of literacy and literacy proficiency, found in the present analysis, lends some credence to the notion that knowing what one knows (or does not know) helps one to learn efficiently. This result points to the usefulness of periodic literacy assessment of job trainees to enhance the proper grasp of their literacy skills. The newly-created DOL Workplace Literacy Test (WLT) will be a useful tool for this purpose.

(d) Parents' educational level and family involvement in literacy-related activities, such as having reading materials at home, are an important contributing factor in developing literacy proficiency. The implication is that workplace literacy is the product of a long-range conscious effort involving both school and family. For job training programs, this finding points to the need to emulate environments conducive to learning.

9. Workplace-literacy learning gains should be included in the performance standards by which to evaluate individual job training programs. This is a logical follow-up to the recommendation of making workplace-literacy training an integral component of job training. Integration of workplace training in job training programs should be accompanied by periodic workplace literacy assessment of individual program participants. The DOL WLT instrument is a suitable tool for these purposes.

10. Individual assessment is valuable also in promoting efficiency in job matching if it is coupled with assessment of individual job (or job cluster) requirements in terms of the three literacy scales -- (prose comprehension, document literacy, and quantitative literacy) so that a job trainee can readily determine her or his readiness for a desired job in terms of workplace literacy. For this reason, an undertaking of job analysis according to the same scales as those in the DOL WLT instrument is recommended.

11. Job training with a workplace literacy component as an integral part should be viewed in a global perspective so that, by enhancing workers' productivity, it will create or bring back jobs while contributing to this country's international competitiveness.

INTRODUCTION

What Was the 1990 DOL Workplace-Literacy Survey About?

The Washington Post (February 24, 1993) reported that there was a U.S. trade surplus in the service sector and that it was steadily rising despite an overall trade deficit.[1] This is symbolic of the growing importance of services in the economy, with the attendant growth in the role of knowledge-intensive labor in the nation's production. It is widely known that the last several decades of changes in consumer demand and in the production technology behind this structural shift were brought about by, and in turn generated the need for, workers with thinking skills at all levels of economic activity.

This trend continues. As the economy becomes more and more complex, workers are required to possess far more sophisticated thinking ability than in the past. The worker who lacks such a skill will face ever-shrinking opportunities for employment, while the worker who has it is likely to experience sustained career growth with minimal disruptions because that worker is endowed with a precious trait in this dynamic economy -- the ability to "change with the changes" and even to create changes.

The foundation of this skill is literacy in a broad sense -- that is, a combination of traditional literacy, numeracy, and the ability to pull together the information obtained from reading and calculations and apply it in real-life situations. This requires information processing, reasoning, and critical thinking capabilities, together with basic reading, writing, and mathematics skills. In the sense that such a comprehensive skill is essential to function in today's workplace, we call it workplace literacy.

Recognition of the increasing importance of workplace literacy led the Employment and Training Administration (ETA) of the U.S. Department of Labor

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[1] John M. Berry, "Forget the Trade Deficit: U.S. Is a Superpower in Services," The Washington Post, February 24, 1993.

(DOL) to commission Educational Testing Service (ETS) to conduct the 1990 workplace literacy survey of ETA's three major client populations -- Job Training Partnership Act (JTPA) program participants, jobseekers registering at the public employment service operated by the United States Employment Service (USES) in affiliation with State employment security agencies, and eligible unemployment insurance (UI) claimants. The purpose of the survey was to assess the state of workplace literacy of ETA's major client populations so that the knowledge obtained could be used in formulating future employment and training programs.

It is useful, at the outset of the analysis of the literacy data, to describe these three ETA programs and the nature of their populations, and to explain briefly the survey method. These discussions will clarify the unique nature of the populations under study and the limit of our interpretation of analytical results.

A. EMPLOYMENT AND TRAINING ADMINISTRATION PROGRAMS AND THE CLIENT POPULATIONS

The Employment and Training Administration is the training and employment security agency of the U.S. Department of Labor. It oversees, among other functions, the training and employment programs under the Job Training Partnership Act, the various job-service activities of the U.S. Employment Service, and the income-security program of the Unemployment Insurance Service (UIS). These programs represent three major facets of public policy on human resources and comprise by far the largest component of ETA's activities.

1. The Job Training Partnership Act

The Job Training Partnership Act of 1982 went into effect in October 1983. Its objective is to bring the jobless into permanent, unsubsidized, and self-sustaining employment by providing training, basic education, job counselling, and placement. The target populations of various program titles include economically-disadvantaged adults and youths, dislocated workers and other groups of workers -- such as Native Americans, migrant and seasonal workers, veterans, and older workers -- who face serious employment barriers. For this reason, the composition of the JTPA client population is quite varied, covering experienced workers as well as new entrants and re-entrants, young and older workers, workers associated with regular and permanent employment as well as those whose employment tends to be seasonal or irregular, disadvantaged individuals, and others. The common thread among all of these seemingly diverse groups is a persistent difficulty in finding jobs. JTPA programs aim to ameliorate this difficulty through training, remedial education, and various types of job services.

The magnitude of this hard-to-employ cohort of the labor force is indicated by the enrollment of more than 750,000 people in JTPA's Title II-A program -- training services for disadvantaged adults and youths -- in Program Year (PY) 1989 (July 1989 to June 1990). Since the inception of JTPA, 660,000 to as many as 827,400 individuals have enrolled annually in the program; cumulatively, almost 5.7 million have been served.[2] The next largest component of JTPA, Title III -- Employment and Training Assistance for Dislocated Workers -- enrolled 167,300 individuals in PY 1989. The total unemployment rate for the United States in 1989 was 5.3 percent, meaning that 6.5 million persons were unemployed. Clearly JTPA programs are providing services to a very sizable portion of the unemployed workforce of the country.

Of all the enrollees who concluded their JTPA program participation[3] in PY 1989, 44 percent were minority, of which 67 percent were black and 27 percent Hispanic; 21 percent were younger than 19 years of age; and 27 percent were school dropouts. That the JTPA participant population consists predominantly of individuals who are disadvantaged in labor market activities is quite clear from a comparison with the total labor force. (See Table 1.) In 1989, average monthly figures showed that, of the civilian labor force, 16 percent was comprised of minority workers (of whom 60 percent were black), 5.9 percent was between 16 and 19 years of age, 5 percent was comprised of those with less than a high school education, 11.3 percent had one to three years of high school education, and 85 percent had a high school education or more.[4]

Thus, the large proportion among Title II-A participants of youths (most with little or no work experience), of those with only a high school education or less, and of dropouts, clearly suggest that besides being economically disadvantaged (a JTPA eligibility requirement)[5], Title II-A participants are disadvantaged in the competition

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[2] JTPA Title II-A and III Enrollments and Terminations During Program Year 1989 (July 1989-June 1990), U.S. Department of Labor, February 1991, Table 1, p. 6.

[3] In JTPA program jargon, these individuals are referred to as terminees.

[4] The Statistical Abstract of the United States, 1991.

[5] "Economically disadvantaged" is defined as: "(A) receiving [or, being a member of a family which receives] cash welfare payments under a Federal, State, or local welfare program; (B) [having or being] a member of a family which has received a total family income for the six-month period prior to application for the program involved (exclusive of unemployment compensation, child support payments, and welfare payments) which, in relation to family size, was not in excess of the higher of (i) the poverty level determined in accordance with criteria established by the Director of the Office of Management and Budget, or (ii) 70 percent of the lower living standard income level; (C) ... receiving food stamps pursuant to the Food Stamp Act of 1977; (D) [being] a foster child; or (E) in cases permitted by regulations of the Secretary, [being] an adult handicapped individual whose own income meets the requirements of clause

Table 1: JTPA Participants and Civilian Labor Force, PY 1989 for JTPA and 1989 for Civilian Labor Force

	JTPA*		Civilian Labor Force
	Title II-A	Title III	
	(%)	(%)	(%)
White	53	71	77
Black	32	16	10
Hispanic	12	10	6**
Other	3	3	-
Younger than 19	25	-	-
16-19 Years Old	-	-	6
19-21 Years Old	15	4	-
School Dropout	29	15	-
Less Than High School	-	-	5
Student (HS or less)	18	-	-
High School	-	-	43
High School Graduate	53	85	85

* JTPA Title II-A is for "economically disadvantaged" adults and youths; Title III is for dislocated workers.

** Hispanic origin any race.

Sources: For JTPA, JTPA Title II-A and III Enrollments and Terminations During Program Year 1989, U.S. Department of Labor, Table 2. For civilian labor force, Statistical Abstract of the United States, 1991.

for jobs and in keeping the jobs they find. Without training, remedial education, or job counselling and placement assistance, these participants would likely suffer from perpetual difficulty in finding jobs and from vulnerability to the changes in labor market conditions in a dynamic economy.

A similar observation can be made about the dislocated workers participating in the Title III program, although they tend to be much older and better educated than Title II-A participants. The JTPA program is carried out in approximately 600 service delivery areas (SDAs) using Federal grants provided through States. Private Industry Councils (PICs) composed of representatives from business, educational agencies, organized labor, rehabilitation agencies, community-based organizations, economic development agencies, and the public employment service, plan training and employment services at the SDA level. SDAs, in turn, contract with individual service providers for classroom vocational training, on-the-job training, remedial education, and job search assistance.

A characteristic of JTPA is that the services provided are individualized to suit the needs of each program participant as well as those of local employers. In other words, the local demand for job skills is taken into consideration in the design of training programs, while participants' academic and skills backgrounds and needs determine their training curricula. Although the specific mix of services differs from site to site, the program typically consists of a troika of basic educational activities, occupational skills training, and job-placement services. The educational component can include both remedial education and preparation for the General Educational Development (GED) examination, often with emphasis on self-paced learning aided by computer-assisted instruction.

2. Unemployment Insurance

The present unemployment insurance program in this country was created by the Social Security Act of 1935 to provide temporary income protection for involuntarily unemployed workers. It is a Federal-State program whereby individual States have specific benefit and financing structures under general Federal guidelines. While the specific benefit provisions vary among States, generally the weekly benefits replace about 50 percent of lost wages. For a large majority of recipients, the benefit protection is for 26 weeks, with additional weeks at times of very high unemployment. In addition to alleviating economic hardship among jobless workers, payment of insurance benefits

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(A) or (B), but who is a member of a family whose income does not meet such requirements." Job Training Partnership Act, Sec. 4 in A Compilation of Job Training and Related Laws, U.S. Congress, Subcommittee on Employment and Productivity of the Committee on Labor and Human Resources, December 1986.

helps maintain a stable supply of workers and provides a degree of economic stability over business cycles.

To be eligible for UI benefits, a claimant must, during a one-year period prior to filing a claim, have earned a certain minimum amount of wages or have worked some minimum number of weeks, depending on individual State requirements. Thus, UI benefit recipients are workers with recent employment experience and substantial past attachment to the labor force. In addition, the recipient of unemployment benefits must be able and available for work, indicating current labor force attachment. Both of these requirements, together with the limited benefit provision, help ensure that the fundamental tenet of unemployment insurance as a human resource program, as compared with a public assistance program, is preserved. It fosters the maximum utilization of existing human resources while minimizing the loss of human capital investment made in the past.

As one would expect, UI benefit recipients and JTPA program participants are quite different. Though not directly comparable, the data presented in Tables 1 and 2 give a rough idea of the differences. First, the UI population includes a smaller proportion of minorities than the JTPA population. Even among the exhaustees of unemployment benefits, who presumably are largely the hard-to-employ segment of UI beneficiaries, the proportion of minorities is much smaller than in the JTPA population (i.e., about 30 percent versus 47 percent in Title II-A and 29 percent in Title III). Nonetheless, this proportion is still larger than that in the total civilian labor force (i.e., 30 and 23 percent among exhaustees and non-exhaustees respectively versus 14 percent) indicating a greater vulnerability of experienced minority workers to fluctuating economic conditions. Secondly, the educational achievement of JTPA Title II-A participants is decidedly lower than that of UI beneficiaries, while JTPA Title III participants compare favorably with UI beneficiaries.

Compared with the total civilian labor force, however, neither UI beneficiaries nor JTPA participants fare very well in terms of schooling. While only six percent of the civilian labor force has attained less than a high school education, over 21 percent of UI beneficiaries had less than a high school education and almost 30 percent of the JTPA Title II-A program participants are school dropouts. The point of this comparison is that although unemployment insurance is essentially a program of income protection for short-term unemployed workers (indeed, about 50 percent of UI beneficiaries expect to be recalled by their former employers), upgrading the skills and general literacy levels of these workers, especially of those who are liable to become displaced workers, is a very relevant issue.

As the maximum benefit duration of 26 weeks indicates, unemployment insurance is designed primarily to protect workers from the short-term income losses typically faced by workers during cyclical downturns. In fact, most beneficiaries return to jobs -- many of them, to their former employers -- once business conditions improve. To illustrate, in recent years, of about 7 to 11 million beneficiaries per year, less than 70 percent have stopped drawing their benefits before reaching the limits to which they

Table 2: Characteristics of UI Exhaustees and Non-Exhaustees

	Exhaustees (%)	Non-exhaustees (%)
Male	55.1	60.4
Female	44.9	39.6
Younger Than 25	9.1	13.4
25 - 44 Years Old	56.7	59.2
45 - 64 Years Old	32.8	25.9
65 and Older	1.5	1.6
White	69.2	76.9
Black	14.8	10.9
Hispanic	11.2	8.9
Other	4.7	3.3
Less Than High School	22.6	20.9
High School/GED	51.2	55.9
Vocational/Technical/ Associate	13.4	13.5
College Graduate	12.7	9.7
Laid-Off	76.1	83.8
Quit	10.0	6.6
Fired	13.2	8.8
Other Reason	0.7	0.8
Dislocated Worker	20.7	9.0
Expected Recall	33.4	54.3
Was Recalled	21.4	51.3

Source: Table II.3, Walter Corson and Mark Dynarski, A Study of Unemployment Insurance Recipients and Exhaustees: Findings from a National Survey, Mathematica Policy Research, Inc., UI Occasional Paper Series 90-3.

were entitled.[6] Presumably, most of these individuals went back to work. At the same time, this means that over 30 percent or more beneficiaries exhaust their benefits after 26 weeks.[7] It is likely that some of these beneficiaries return to employment (or exit from the labor force) after exhausting their benefits, but many would, no doubt, remain jobless. The 1988 study by Mathematica Policy Research found that 76 percent of unemployment benefit recipients were reemployed after 39 weeks of joblessness.[8] This implies that almost one fourth of beneficiaries are still looking for work after 39 weeks; similarly, the Mathematica study found that almost 19 percent of unemployment benefit recipients were unemployed after 51 weeks. Thus, it is reasonable to assert that a sizable number of unemployed workers undergo joblessness long after they exhaust the short-term income protection of unemployment insurance.

Among the UI beneficiaries, therefore, it is this group of exhaustees for whom training/education programs, together with various types of job services, are particularly needed. The difference in the type of services needed for these workers from that required for most JTPA program participants can be gleaned from the comparison of the UI exhaustee and non-exhaustee characteristics in Table 2. Reflecting that UI eligibility is limited to experienced workers, UI beneficiaries are, on the average, older than JTPA Title II-A participants. Further, the UI exhaustees tend to be older than the non-exhaustees and, curiously enough, contain a larger proportion of college graduates. This might suggest: a prevalence of structural unemployment among the exhaustees due to the technological obsolescence of their skills or to a shift in demand, or the difficulty older workers experience in finding new jobs, even if their skills remain relevant, because employers are reluctant to hire older workers. In any case, a concentrated effort is needed to retrain and/or to provide reemployment assistance for the UI exhaustees to make the desired transition.

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[6] More precisely, the first-payment figure has been ranging between about 6.8 million and 11.6 million annually for the last 10-year period. The proportion of exhaustees has been ranging between about 26 percent and 40 percent for the same period. Source: Unemployment Insurance Service, U.S. Department of Labor.

[7] According to the 1988 survey by Mathematica Policy Research of unemployment benefit exhaustees, exhaustees tend to be eligible for unemployment benefits for a shorter duration than non-exhaustees. For example, 26 percent of exhaustees were eligible for 20 or fewer weeks of benefits while only 12 percent of non-exhaustees were eligible for the same duration of benefits; and 60 percent of exhaustees were eligible for 26 weeks of benefits while 74 percent of non-exhaustees were eligible for the same duration. From the way the potential benefit durations are determined, this implies that either the exhaustees are less firmly attached to the labor force (or to employment covered by unemployment insurance) or their wages are very low compared to those of non-exhaustees. Walter Corson and Mark Dynarski, A Study of Unemployment Insurance Recipients and Exhaustees: Findings from a National Survey (NTIS PB91-129247), U.S. Department of Labor, UI Occasional Paper Series 90-3, 1990.

[8] Ibid.

Rather than waiting until beneficiaries exhaust their unemployment benefits to provide training and job services, it would be more efficient to start these services as soon as benefit claims are filed. Accordingly, an early warning system of benefit exhaustion is needed to identify those who are likely to exhaust (i.e., who are having difficulty finding reemployment). Evaluation of individual claimants by such an early warning system would be especially appropriate for those who do not expect a recall by former employers -- about half of all beneficiaries according to the Mathematica study.[9] However, the opportunity for training and reemployment assistance, the need for which may be indicated by such evaluation, should be open not just to those who are found likely to exhaust, but to any beneficiaries who might wish to avail themselves of the service. In this age of rapidly-changing technology, today's productive skills can easily be tomorrow's obsolete skills, and the needs of any workers who wish to retrain to guard against potential future crisis should be given full recognition. Further, training and job services which expedite beneficiaries' reemployment at better jobs than they might find without these services, and at jobs commensurate with their skills, are desirable on economic efficiency grounds. In addition, the consequent reduction of the duration for which UI benefits are drawn conserves the UI fund.

3. Employment Service

The Wagner-Peyser Act of 1933, as amended in 1982, established the jointly financed Federal-State system of public employment service. Under this law, States are provided with funds to operate labor-exchange systems that respond to the specific conditions of each State and meet the demand of its employers and workers. The mission of the public employment service operated by the United States Employment Service through State employment security agencies includes: assisting jobseekers to find employment in jobs that are commensurate with the skills they possess; assisting employers in filling job vacancies with workers who meet their job requirements; providing interstate job-market clearance through exchange of information on labor market conditions; assisting the UI system by ensuring that UI beneficiaries meet the so-called "work test" whereby they demonstrate "ability and availability" to work as a condition for UI eligibility; and providing job-counselling services to the handicapped and others. To carry out these functions, the Federal-State employment service system operates about 2,000 local employment service offices, which assist jobseekers and employers at no charge.

The Employment Service client population is a diverse mixture of jobseekers, the most distinct grouping being applicants who are simultaneously drawing unemployment benefits. All State UI laws require that a person be able and available to work in order to be eligible for unemployment benefits, and registration for work at a public employment service office is regarded as an evidence of such "ability and availability." As a consequence, UI recipients make up a large proportion of all job applicants at public employment-service offices. For example, in PY 1989, 35 percent of the 18.4 million total applicants were UI beneficiaries. (See Table 3 for detailed characteristics of ES applicants.)[10]

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[9] Corson and Dynarski, op. cit., Table II-6.

The diversity in Employment Service job applicants and, implicitly, in their labor market characteristics, gives rise to fundamental differences in the types of services needed in order to bring about an optimal match of jobseekers and jobs. On one hand, the very fact that applicants are UI beneficiaries indicates that they are experienced workers with recent employer attachment. Many of them have had a substantial work record; and, as pointed out earlier, about half of all UI claimants expect recall by their former employers. Thus, although a significant proportion of UI beneficiaries do exhaust their benefits and suffer extended periods of joblessness, typically they tend to be more employable than the new entrants and re-entrants who seem to predominate among ES applicants. Thus, for UI beneficiaries, the emphasis might be more on job search assistance than on training. Conversely, the other employment-service applicants are more likely to have less work experience in the recent past and little prospect of returning to their former employers. New entrants and re-entrants into the labor force, workers with irregular patterns of employment, and exhaustees of unemployment benefits would comprise a large portion of this group. Training and retraining might be key program requirements, along with various job-search assistance services. However, types of training and job-assistance needs would vary among them also since, for example, the needs of UI exhaustees and new entrants obviously differ greatly.

Table 3 shows the difference between the UI-recipient component and other employment service job applicants. With respect to the characteristics examined here, the difference between the two groups is remarkable. A greater concentration of UI beneficiaries is in the mid- to upper-age group and consists of white, male high school graduates, suggesting their relatively greater labor market experience and employment attachment. Specifically, over 19 percent of other ES applicants, in contrast to only 2.4 percent of the UI beneficiaries, are 19 years old or younger, indicating a large concentration of new entrants or inexperienced job applicants among the former. In contrast, 82 percent of UI beneficiaries, as compared with 66 percent of other ES applicants, are in the mid-age group (i.e., 22 to 54 years old), reflecting a greater concentration of experienced workers. The larger proportion of women among the ES-only applicants than among the UI beneficiaries suggests a larger proportion of new entrants or re-entrants among the former group. The 10-percent difference in the proportion of high school graduates (75 percent versus 65 percent) in favor of UI beneficiaries shows their advantage in employability. Thirty-eight percent of the ES-only applicants are minorities while 30 percent of UI-ES applicants are minorities.

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[10] "Selected ES Service Data on Individuals and Outcomes, Program Year 1989," U.S. Employment Service.

Table 3: Characteristics of Employment Service Job Applicants, 1985

	Employment Service Applicants			Applicants Placed
	Total (%)	ES/UI* (%)	ES Only** (%)	(%)
15 and Under	1.4	-	2.1	4.0
16 - 19	12.2	2.4	17.2	22.3
20 - 21	9.3	6.2	10.9	12.4
22 - 39	55.7	61.9	52.6	47.9
40 - 54	15.6	20.6	13.0	10.2
55 and Over	5.6	8.8	4.0	3.2
Male	54.2	57.5	51.5	57.0
Female	45.8	40.5	48.5	43.0
Completed Grades 0-7	4.3	4.4	4.2	4.5
" " 8-11	27.5	21.4	30.6	31.8
High School Graduate	45.7	49.9	43.6	43.9
Over 12 Years of School	22.3	24.1	21.3	19.5
White (Not Hispanic)	66.3	70.5	64.2	63.3
Hispanic	8.9	10.0	8.4	9.3
Other	12.3	2.7	5.9	3.7

* ES job applicants who draw unemployment benefits.
** ES job applicants who do not draw unemployment benefits.

Source: United States Employment Service.

The apparent focus of the labor-exchange function of the Employment Service on disadvantaged applicants is reflected in the characteristics of the applicants placed by public employment-service offices. A comparison of employment-service placements with either the total employed population or the ES-applicant population (see Table 3) clearly indicates that youths, jobseekers with limited schooling, and non-whites are much more heavily represented in the placements than in any of the other groups. While this may be partly due to the concentration of entry type (or low skill) job vacancies listed by employers with the public employment service, it strongly suggests that the disadvantaged are the principal clients of the employment service.

4. Summary of Programs

The preceding descriptions of the three ETA programs and their participants identify the unique nature of the populations from which the 1990 workplace literacy survey samples were drawn. The survey samples were taken from the population of JTPA-eligible applicants and the population of the applicants at State employment service offices, which includes UI claimants applying for jobs. (It should be noted that this latter population does not include all UI claimants since some of them are not required to register at employment service offices for jobs.) It is clear that these two survey populations are different not only from the general population or from workers in the labor force but also even from the population of unemployed workers. For example, JTPA participants tend to be heavily disadvantaged with persistent joblessness and other characteristics associated with such a barrier. The ES/UI jobseeker population may tend to contain a large weight of experienced workers because of the UI eligibility provision. For this reason, interpretation of the analytical results in this study must be done with care.

B. THE LITERACY ASSESSMENT AND SURVEY METHODOLOGY[11]

Without duplicating the detailed description given in the final report produced by Educational Testing Service, we will briefly describe three aspects of its survey methodology that are essential in understanding the analysis of this study. They are the definition and measurement of literacy, the sampling design, and the literacy-assessment method and scoring procedure.

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[11] For a detailed description of the assessment method and sampling methodology used in this survey, see Irwin S. Kirsch and Ann Jungeblut, Profiling the Literacy Proficiencies of JTPA and ES/UI Populations: Final Report to the Department of Labor (Princeton, NJ: Educational Testing Service, September 1992). For a comprehensive treatment of the technical details of the method commonly involved among various literacy assessments conducted by ETS, including the DOL survey, the NAEP surveys, and the on-going National Adult Literacy survey of the Department of Education, see Albert E. Beaton, ed., Implementing The New Design: The NAEP 1983-84 Technical Report, National Assessment of Educational Progress, March 1987. For a critical review of the ETS method, see Laura H. Salganik and Joseph Tal, "A Review and Reanalysis of the ETS/NAEP Young Adult Literacy Survey," report prepared for Office of Planning, Budget, and Evaluation, U.S. Department of Education (Pelavin Associates, Inc.).

1. Definitions

The literacy assessed in the DOL survey is workplace literacy, as distinct from the conventional notion of being able simply to read and write. It is defined by ETS, architect of the assessment instrument, as "[U]sing printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential."[12] This is a general description of what we commonly and variously call the information-processing, critical thinking, synthesizing, or reasoning ability; implicit in this definition is that the basic reading, writing, and mathematics skills are subsumed. The literacy the survey has assessed, therefore, is the ability that is readily useful in the workplace.

This ability, according to ETS, is a crystallization of proficiencies in three areas -- prose comprehension, document literacy, and quantitative literacy. The assessment instrument measures proficiency in each of these areas ("scales," in measurement jargon -- see Table A-1-3(c).) The nature of the skills reflected in these areas can be grasped from the following description of the questions (or "tasks") pertaining to the three types of literacy:

> Prose simulation tasks required the reader to demonstrate the knowledge and skills associated with understanding and using information from texts that include editorials, newspaper articles, stories, poems, and the like.
>
> Document simulation tasks required readers to demonstrate the knowledge and skills associated with locating and using information contained in job applications, payroll forms, bus schedules, maps, tables, indexes, and so forth.
>
> Quantitative simulation tasks required the reader to perform different arithmetic operations, either alone or sequentially, using information embedded in both prose and document formats. Included here were such tasks as entering cash and check amounts onto a bank deposit slip, balancing a checkbook, completing an order form, and determining the amount of interest from an advertisement for a loan.[13]

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[12] Irwin S. Kirsch, Ann Jungeblut and Anne Campbell, Beyond the School Doors (Princeton, NJ: Educational Testing Service, September 1992), p. 3.

[13] Kirsch and Jungeblut, op. cit., p. 12.

Two notable points here are, first, that the skills required to perform these tasks are those everyone faces in everyday life and in the workplace and, secondly, that the performance of any one task often involves proficiency in more than one area of literacy. (In other words, skill in one area of literacy does not occur in isolation from skill in other areas.)

2. Sampling Design

The populations from which the sample was drawn were new applicants eligible to participate in either Title II-A or III programs (in the case of JTPA) and new job applicants at local Employment Service offices, including initial UI claimants required to register with the Employment Service. Stratified random samples of 2,462 JTPA-eligible applicants and 3,259 ES/UI jobseekers were chosen in 14 states in the case of JTPA and 16 states in the case of ES/UI. The country was divided into nine strata (regions), and for each sampling two states were selected from each stratum, with replacement and with a probability of selection proportional to the size of the program-participant population. Subsequently, four SDAs, in the case of JTPA, and four Employment Service local offices, in case of ES/UI, were chosen at random from each selected State, with replacement and with a probability proportional to size of the program. In the case of JTPA, where there was more than one training site per SDA, one training site was chosen from the selected SDA and was proportional to the SDA's size. Fourteen states were selected for the JTPA sample, and 16 states were selected for the ES/UI sample. They are:

> JTPA: Arizona, Arkansas, Florida, Indiana*, Kentucky, Louisiana, Minnesota*, Missouri, New York*, North Carolina*, Pennsylvania, Utah, Virginia, and Washington.
>
> ES/UI: Alabama, California*, Florida, Illinois, Indiana, Kansas, Maryland, Massachusetts, New York, North Carolina, Ohio*, Oklahoma, Tennessee, Texas, Utah, and West Virginia.
>
> * States chosen twice.

3. Assessment Method and Scoring

The assessment was conducted between November 1989 and July 1990. ETS created about 120 test items (i.e., questions) that could be administered in assessment. However, it limited assessment time to 60 minutes, which meant that not all test items could be administered to any one respondent. So, each participant in the survey was asked to respond to a subset of all items. The responses to the remaining items were estimated for each respondent by use of a form of logit regression, called the item response theory (IRT) model, making use of the relationship between the probability of a correct answer for each item and the background characteristics of the respondent. Thus, a respondent's proficiency score is an estimate subject to sampling error. This fact makes statements regarding the literacy level of any one respondent, or even of some smaller sub-groups, highly variable.

Estimated individual proficiency scores range between 0 and 500, the latter being the highest level of literacy; and a score below 226 is generally considered to represent a literacy level quite inadequate to perform in the workplace. The estimated workplace literacy profile of a respondent (or of a population or sub-population) is three-faceted -- prose-comprehension score, document-literacy score and quantitative-literacy score.

4. The Assessment Score as a Human Capital Indicator

The literacy-proficiency scores obtained in the DOL workplace-literacy survey are a useful and direct human capital indicator that was unavailable in the past. Previous studies of the economic role of human capital have had to rely principally on years of schooling as a proxy variable. However, years of schooling stand merely for the "process" of learning, and are a valid measure of the "substance" of learning only to the extent that each stage in the process is precisely and universally associated with a distinct substance of knowledge and skills. This limitation is compounded by the diverse quality of education offered by different school districts, in different states, and as part of a decentralized network of educational policy-making.

As a consequence of this situation, schooling has come to be regarded as an indicator, at least partially, of the personal qualities (such as motivation, tenacity, etc.) that drive or fail to drive a student to achieve a certain educational level rather than as an indicator of learning itself. The labor market has thus adjusted itself to view educational levels accordingly, as evidenced in the practice of credentialling. It is obvious, therefore, that schooling is not necessarily a sufficient measure of cognitive skills.[14] The availability of workplace-literacy proficiency scores enables us to do away with this intermediary measure and go directly to the measure of the substance of learning, and it should help us to attain a sharper grasp of the role of human capital in the economic achievement of workers than was possible before.

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[14] Evidently this point is widely recognized among the job and literacy training practitioners. As Auspos and Sherwood state (in their assessment of JOBS programs), "... JOBS programs need methods of assessing basic skills beyond ascertaining the number of years participants spent in school ...." Patricia Auspos and Kay E. Sherwood, Assessing JOBS Participants -- Issues and Trade-offs, Manpower Demonstration Research Corporation (August 1992), p. 28.

CHAPTER I

LITERACY AND LABOR MARKET PERFORMANCE

The importance of literacy in the American economy has come more and more into sharp focus in recent years because of the realization that the literacy of workers directly translates into productivity. The purpose of this chapter is to evaluate the importance of workplace literacy, in the sense of the ability to synthesize information and utilize it for independent thinking, in order to attain labor market success. "Workplace literacy," viewed in this manner, is clearly different from the traditional notion of literacy that is centered around reading, writing, and arithmetic, often in isolation from each other. In this chapter, we argue that workplace literacy, which integrates the three R's through analytical thinking capability, is crucial in the success of workers in the workplace.

Additionally, we argue that the broad literacy proficiency that underlies workplace literacy is essential for workers' lasting achievements in the labor market as against proficiency in narrow job-specific skills. This chapter also explores the effects of literacy on various measures of labor market success for unemployed workers, using data collected in the workplace-literacy survey of job applicants in the employment-security system (i.e., Employment Service and Unemployment Insurance) and of eligible applicants for JTPA. Labor market success, as indicated by annual earnings data -- including hourly wages, weeks worked per year, and hours worked per week -- is a function of a number of factors, of which literacy is one. We attempt to separate the effect of literacy from other relevant factors. In the process, we also evaluate the relative importance of other strategic variables and how it changes once the effects of literacy are taken into consideration.

This chapter starts with a conceptual framework for analyzing the determinants of labor market success. The major focus is on the way each of the strategic variables, of which literacy is one, exerts a force on the demand for and/or the supply of labor and ultimately affects the outcome of workers' labor market activity. The next section is a statistical testing and estimation of this conceptualization of how the labor market operates, with a main focus on evaluating the effects of three workplace literacy indicators -- prose comprehension, document literacy, and quantitative literacy -- on labor market success. We estimate what percentages change in hourly wages, weeks worked, and hours worked as a result of the unit change in each literacy score. We perform a similar statistical analysis with respect to other strategic variables, including personal and family characteristics, skills, years of work experience, and welfare-receipt status. Finally, drawing from the results of statistical analysis, we highlight significant policy inferences.

A. DETERMINANTS OF LABOR MARKET PERFORMANCE

The two questions for which we wish to find answers in this chapter are "What determines the economic well-being unemployed workers experience as a result of their labor force activities?" and "What role does literacy play?" This section addresses indicators of economic well-being and how they are affected by various relevant factors, including literacy.

In this analysis, we rely on earnings, wages, and employment as indicators of workers' economic achievement. However, these material measures alone obviously do not comprehensively denote a worker's well-being. The quality of work life resulting from the degree of satisfaction and the prospects for career advancement must also be added in. Labor market performance must be assessed in terms of a worker's overall well-being, encompassing both material and non-material achievements realized as a product of his or her activities in the labor force. However, it is difficult to measure qualitative factors, so past empirical studies have focused narrowly on economic aspects (usually measured by annual earnings attained). Our analysis will also be confined to indicators of economic well-being.

Next, we identify the determinants of economic well-being and the reasons why they may be important. Later, we examine the relevance of these factors and evaluate statistically the importance of each. In doing so, we will be able to estimate the net role of literacy in determining a worker's labor market achievements. A worker's annual earnings, as an indicator of achievement in the labor market, are a product of three distinct components of labor market activity -- wage rate, length of work, and intensity of work. A worker's observed wage rate at a given point in time is a product of the demand and supply forces associated with the particular skill. These forces also determine the actual amount of employment at any point, the number of weeks of work during a year, and the intensity of work measured by hours worked per week. Number of weeks worked, however, differs from wage rate in that the former component represents a cumulative result of week-to-week outcomes in the labor market, and therefore changes in demand and supply play an added role in its determination.

1. Factors Governing the Demand for Labor.

The hourly wage paid and the amount of labor actually used are determined not only by the general levels of demand for and supply of labor of specific types but also by employer and worker response to varying wage rates. In economic jargon, the equilibrium wage rate and the labor input are functions of the shapes as well as of the positions of demand and supply curves. Therefore, identification of the determinants of wage rates and employment boils down to a search for the factors that govern the shapes and positions of the demand and supply curves of labor of a given type. For demand for labor, this means the factors governing the physical productivity of labor, the price(s) of the good produced with the input of the specific type of labor in question, and the extent of competition among the employing firms in search of workers.

(a) Labor Productivity

The productivity of a worker at a given job is, to a large extent, a function of the level of capital investment of two types -- i.e., human capital investment in the form of education and training and physical capital investment in machines, equipment and other complementing facilities. While the two types of capital investment differ in the way they manifest themselves, they complement each other in enhancing the productivity of the worker. It seems that this complementarity is particularly prevalent in today's production processes, where advanced machinery and other capital equipment require correspondingly sophisticated technical knowledge and capacity on the part of workers.

Further, it is important to note that not only the quantity but also the quality of capital stock makes a difference -- be it human or physical capital. Hence, steady investment flow, with the assurance of continuous updating of the technological and knowledge contents of capital of both types, is crucial in ensuring high levels of productivity. This need is keenly felt in today's rapidly changing technology and knowledge when, for example, highly sophisticated machines being introduced and continuously upgraded can be successfully operated only by workers with equally state-of-the-art skills. Since technological innovations play a crucial role in determining the productivity-enhancing power of these capital goods, and, since these capital goods must be continuously updated in order for them to be effective, the currency of investment flow -- as much as the amount of existing physical capital itself -- is crucial in determining the productivity of labor.

A similar point holds for human capital investment. In the face of rapid change in demand and production processes, there is a constant need for workers to upgrade their skills by a continuous process of training and retraining throughout their working career. Thus, the "flow" of human capital investment is perhaps more crucial than the amount of accumulated past investment ("stock") reflected, for example, in the years of schooling attained in some distant past.

To the extent that literacy represents human capital, this implies not only that a high level of literacy must be maintained in order to ensure correspondingly high levels of productivity, but also that the literacy proficiency of workers must be continuously improved and updated in order to keep pace with changing requirements in the workplace. Thus, one would expect a strong positive correlation between literacy proficiency and the physical productivity of workers, unless this proficiency is held back by the lack of adequate capital investment.

(b) The Price of Final Product

The value of the productive contribution of workers becomes meaningful to the ordinary employer and hence can be translated into wages only when the monetary valuation of produced goods and services is made in the product market. Thus, the price at which the produced good is sold in the product market is another integral determinant of the wage rate, and factors governing the price-making in the product market are also factors in the demand for labor and wage-rate determination.

General economic conditions and the structure of the product market are important ingredients in the demand for labor and wages. When economic conditions are bad, a downward shift in the demand for products tends to depress the price and, ultimately, to cause a downward pressure on the demand for labor. Variation in the structure of the product market also gives rise to diversity in the demand for labor. In addition, the degree of competition in the product market makes a difference in the number of workers to be hired and the wages to be paid.

(c) The Structure of Factor Market

The extent of competition among employers in hiring workers is also reflected in the shape of the demand curve for labor. This point is particularly relevant, on one hand, when the skills of workers are firm- or industry-specific and/or when there are institutional restrictions that obstruct labor mobility; in the latter case, the employers have a monopolistic (monopsonistic) control over hiring unless workers themselves take concerted action in bargaining for wages and employment. On the other hand, the intensity of competition in hiring results in an increasingly flat total-demand curve for labor and enables workers to command higher wages than if the competition is less keen.

2. Factors Governing Labor Supply

The explanation of the labor market achievement of workers would not be complete unless we examine the labor-supply side. Wages and employment are also affected by the nature of labor supply as represented by the shape and position of the labor-supply curve, which in turn, is determined by labor force participation decisions of workers in the same labor market (i.e., with similar skills), structure of the labor market, local economic conditions, and the occupational downgrading of unemployed workers.

(a) Workers' Labor Force Participation

The labor force participation decisions of workers depend on how they value non-work activities relative to work. In turn, the nature of this work-leisure trade-off is determined, on one hand, by what additional income from work can do for a worker and, on the other hand, by the utility one can derive from another hour of non-work. This relative value of work over non-work varies depending on external conditions. For example, if one were suddenly to come into a large inheritance, clearly the value to him or her of a dollar of income from work relative to an hour of leisure would change. Similarly, among workers with varying earnings and wealth, the relative valuation of added income from work is quite diverse. It follows that decisions as to whether or not to work and how much to work are greatly influenced by such factors as availability of additional income or family financial resources. In addition, if the argument for the presence of work disincentives is to be believed, the receipt of transfer payment would adversely affect the unemployed worker's decision to seek work by reducing the urgency of the need to earn income. Furthermore, the value of work (or of the income from work) relative to the enjoyment of leisure varies from one worker to another and can change over time. For example, over the years, as a result of increasing general affluence, society has seen a gradual shift of emphasis to greater enjoyment of life. Thus, at any level of income associated with an additional hour, day, or week of work, the worker has a greater preference for non-work.

(b) Structure of Labor Market

Just as the structure of the product market influences the way the demand for labor is formed, the structure of the labor market itself affects labor supply and wage rates. Depending on the relative bargaining position of workers and employers, the supply curve of labor can be flat or upward-sloping. Thus, for example, if a firm is the only employer in the labor market, it would pay a wage which is generally lower than the wage it would pay under conditions of competitive hiring. At the same time, if the workers have control of their labor supply for reasons such as strong union power or the possession of highly specialized skills that are difficult to substitute for, they would be in position to demand and achieve higher wages than under conditions of intense competition among workers for jobs.

(c) Local Economic Conditions and Occupational Downgrading

The supply of labor at a given wage rate can shift up (or the supply curve shifts to the right) as a result of an increase in available workers. This possibility can occur in times of business downturn, when displaced workers crowd the labor markets of occupations with which they had not been associated earlier, and are compelled to seek jobs at lower skill levels. Thus, in the labor markets of certain skills and locales, the wage-depressing effect of recession from the product-demand side is exacerbated by the inflow of additional jobseeking workers. Moreover, the lower wages and increased labor supply would not guarantee increased employment or stable employment because of the contracting demand for labor.

3. Unique Determinants of Length and Intensity of Work

To the extent that the observed number of weeks worked reflects labor input as part of the interplay of demand and supply in the labor market, it is a product of the market forces that also determine wages at the same time. For this reason, the product demand and the labor-supply conditions that govern wage-rate determinations are equally relevant in explaining the number of weeks worked. In other words, the forces that boost the demand for labor tend to increase the amount of labor input and hence the number of weeks of work, while the forces that shift the supply of labor are likely to change the number of weeks worked -- although the direction of change may or may not be identical to that of the change in wages. Thus, the structure of both the product and factor markets, the economic conditions surrounding the labor market, and other factors relevant to wage determination, are also relevant as explainers of weeks worked.

At the same time, whereas the wage-rate statistic for a worker is an average for the observation period (i.e., one year for the survey data in the present analysis) and, also, whereas the wage rate at any point in time is a return to labor of all workers of the same type collectively, the number of weeks worked is a composite of 52 weekly labor force participation decisions of an individual worker: for each week, the labor force behavior of an individual worker may differ from the behavior that is displayed by the general group of workers and that culminates in the market wage rate and employment. In this sense, individual characteristics related to labor-force behavior are expected to loom much larger with respect to weeks worked than with respect to wage rate. They include those variables that affect the work-nonwork choice, such as the extent of alternative income, as well as those variables that are unrelated to the individual's economic decisions but that institutionally limit her or his labor force participation, such as racial or sexual discrimination.

Average weekly hours worked, combined with weeks worked, indicate the total amount of labor supplied by an individual worker. Hours worked, however, represent the intensity of work, which may originate in the worker's motivation and outlook about work or may be characteristic of the specific type of occupation chosen.

4. Non-economic Factors in Labor Market Performance

In addition to factors that explain demand or supply conditions in the labor market, there are non-economic factors that give rise to different labor force performance depending on the worker. One group of such factors pertains to personal characteristics of workers, such as sex and race. While there are cases in which differential treatments are justified on the basis of the so-called BFOQ (bona fide occupational qualifications), which, for example, make it necessary to hire the members of one gender rather than another, such instances are very few today. And, once any gender or racial differences are explained away by such variables as the years of experience with which they may be correlated (e.g., shorter years in the labor force among women than among men because many women are re-entrants after raising children as homemakers), much of the preferential hiring and differential treatment is ascribed to discriminatory practices which are illegal but which exist nevertheless.

Another factor that may be unrelated to the substantive productive capacity of workers but that nonetheless makes a difference in hiring and advancement is whether or not a worker possesses a diploma -- high school or college depending on the occupational level. An employer may perceive that a diploma makes a difference in productivity; but in reality there is frequently little substantive productivity difference between holders and non-holders of diplomas. In the absence of a precise measure of the applicant's true ability -- including drive, self-reliance, teamwork, leadership, and other desirable traits -- the employer often elects to rely on the high school diploma or college degree as "signalling" evidence of such traits. In addition, the advantages that diplomas or college degrees initially accord job applicants are likely to be perpetuated throughout working careers because of "seniority based" promotion or an "old boy network."

Finally, regional differences in cost of living and average income level clearly bring about a variation in the wages of workers even if everything else is the same. Thus, the analysis of wage and employment variations must take account of such regional differences in wages and/or price levels.

5. Summary of Performance Determinants

In the preceding discussion, we tried to portray in general terms the complex forces generated by various factors, including literacy, and how they determine workers' labor market achievements. Our intent was to pave the way for a multivariate approach to the analysis of literacy and its relationship to the earnings and employment of unemployed workers. In order to show that literacy is indeed an important factor in the workers' achievements in the labor market, it is necessary to recognize other relevant variables and to analyze the role of literacy apart from their effects so that we can be sure that the statistically-observed relationships between literacy and wages, employment, and earnings indeed reflect the workings of literacy and not of other variables correlated with literacy. Similarly, it is useful to find out to what extent the observed effects of some of these other variables on workers' economic achievements are, in fact, attributable indirectly to literacy.

B. LITERACY AND LABOR MARKET PERFORMANCE

The measure of workplace literacy developed by Educational Testing Service and used in the Department of Labor survey of JTPA and Employment Service/Unemployment Insurance client populations, emphasizes comprehension and reasoning ability in three areas -- prose comprehension, document literacy, and quantitative literacy. Since it assesses an individual's ability using task descriptions that are couched in terms of actual life and work experiences, proficiency scores are expected to closely reflect the human capital content of the workers that is actually useful in their productive activities in the workplace. In this sense, the ETS measure of literacy differs from traditional literacy measures, which concentrate on the academic skills of reading, writing, and arithmetic in isolation from the world of work. In today's complex workplace, the traditional emphasis on the three R's by themselves is less and less relevant in measuring a worker's ability to function in the workplace, and must be complemented by attention to comprehension, reasoning, and communication. The ETS literacy measure is suited for assessing this type of literacy; accordingly, it has the promise of being a true measure of workplace literacy. The purpose of this section is to examine how important literacy defined in this manner is in explaining the labor market success of workers.

1. Statistical Modelling[15]

Based on the preceding discussion, we envision a single-equation multivariate model depicting the relationships between labor market achievement on one hand and literacy proficiency and a set of other explanatory variables on the other:

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[15] Non-technical readers may skip this sub-section. The main points of this sub-section are to present the statistical model and to show the potentiality of measurement errors inherent, due to the nature of data for proficiency scores, in the statistical evaluation of literacy in the labor market achievement of workers.

$$Y_i = b_1 WLT_i + V_i B + e_i \text{ .... (1)}$$

where Y is a labor market achievement indicator (i.e., wages, earnings, or employment); WLT is the proficiency score in one of the three areas of workplace literacy; b_1 is the regression coefficient for the proficiency score, V is a (1 x K) vector of other variables representing the factors we identified in the preceding section as being relevant to determining wages and employment; and B is a (K x 1) coefficient vector and e is the error term. The proficiency score is isolated in this expression from other explanatory variables in order to focus on the measurement-error issue present in our data for this variable.

The workplace literacy survey was designed so that no individual respondent was asked the complete set of assessment questions; missing responses were statistically estimated. Through its plausible value approach, ETS generated five estimates (plausible values) of the proficiency score in each literacy area for every individual respondent. In this paper, we will report the result of the analysis using the mean plausible value for each literacy scale.[16]

Because the proficiency score for each respondent is an estimate, it is subject to measurement error.[17] Accordingly, the observed proficiency score (i.e., the mean of plausible values) is composed of the true score and an error term -- i.e.,

$$WLT^* = WLT + r \text{ .... (2)}$$

where WLT* is the observed score and r the measurement-error term. Inserting (2) in (1) and focusing on the literacy-proficiency term,

$$\begin{aligned} Y &= b_1 WLT^* + (e - b_1 r) \\ &= b_1 WLT^* + e^* \text{ .... (3).} \end{aligned}$$

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[16] According to the experts at Educational Testing Service who created the plausible value method, the use of the mean plausible value would tend to bias upward the estimated regression coefficient for the proficiency score, and it is preferable to estimate regressions using various plausible values and to obtain the mean of the estimated coefficients. For a comparison, we calculated five separate regressions for five plausible values per literacy scale and obtained the average of regression coefficients. The results are quite similar to the outcome of the approach used in our analysis.

[17] For a description of the score-estimation procedure, see the introductory chapter of this study and, for more technical detail, Robert J. Mislevy and Kathleen M. Sheehan, "Marginal Estimation Procedures," Chapter 10.3, Beaton, ed., op. cit., pp. 293-390.

The ordinary least square (OLS) regression of Y on observed proficiency score would, therefore, be biased, since the error term e* is correlated with WLT*; and the estimated regression coefficient needs to be adjusted for the bias by,

$$b_1/(1 - \sigma_r^2/ \Sigma wlt^{*2}_i) \text{ .... } (4).^{18}$$

Thus, if we can obtain an estimate of the variance of the measurement error (r), it is possible to make an unbiased estimate of b_1, or it is possible to evaluate the extent of bias due to the measurement error.[19]

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[18] The OLS estimate of b_1 is biased even if r is distributed as $N(0, \sigma_r)$, since $Cov(e^*, WLT^*) = E[(e - b_1)(WLT + r)] = -b_1 \sigma_r^2$. Expressing in terms of the differences from the mean,

$$\hat{b}_1 = (\Sigma wlt^* y_i/(\Sigma wlt^{*2}_i)$$

$$= (b_1 \Sigma wlt^{*2}_i + \Sigma wlt^*_i e_i)/(\Sigma wlt^{*2}_i) \text{ ... the OLS estimate.}$$

Then, $\bar{\hat{b}}_1 = \hat{b}_1(1 - \sigma_r^2/\Sigma wlt^{*2}_i)$, i.e., the expected value of the OLS estimate; and the estimate, corrected for the bias, is,

$$\tilde{b}_1 = \bar{\hat{b}}_1/[1 - (\sigma_r^2/\Sigma wlt^{*2}_i)] .$$

[19] The observed proficiency score for an individual i that we used for the analysis is the mean of five plausible values --

i.e., $WLT_i = \sum_j^5 PV_{ij}/5$ where PV_{ij} is the j-th plausible value for the i-th individual.

Then, taking advantage of the knowledge of five plausible values, we estimate the variance of measurement errors of WLT_i by V(PV/5) -- i.e.,

$$V(PV/5) = s_r^2 = \sum_i^n \{[\sum_j^5 (PV_{ij} - WLT_i)^2/5]/5\}/n.$$

s_r^2 replaces the numerator of the second term in the adjusting factor in Equation (4); and, $\sum_i^n (WLT_i - M_{wlt})^2$ is the denominator where M_{wlt} is the mean of observed proficiency scores.

However, as seen in the analysis of the determinants of literacy in the next chapter, the proficiency score (WLT) is highly correlated with some of the explanatory variables included in V. Thus, the errors in measurement of WLT have an implication on the values of regression coefficients, not only of the proficiency score, but also of these other variables from:

$$\beta = [X'X - R]^{-1}X'Y \text{ .... } (5),$$

where β is a (k x 1) vector of regression coefficients, X is a (k x n) matrix of observed values of explanatory variables of which the first component is the proficiency score, R is a (k x k) co-variance matrix of measurement errors*, and Y is an (n x 1) vector of the indicator of labor market achievement

Having thus noted the potentiality of the downward bias in the estimates for the effects of literacy proficiency on various indicators of labor market achievement, in this chapter we take a simple approach by using the OLS estimation of the regression models.

2. Selection of Variables

The proficiency scores from the ETS literacy test will be used to approximate individual workers' potential productivity (or human capital). Three facets of literacy are identified -- prose comprehension, document literacy, and quantitative literacy; and proficiency of workers is measured with respect to each facet by the ETS literacy-assessment instrument. The prose comprehension score measures a worker's "knowledge and skills associated with understanding and using information from texts that include editorials, newspaper articles, stories, poems, and the like." The document literacy score measures a worker's "knowledge and skills associated with locating and using information contained in job applications, payroll forms, bus schedules, maps, tables, indexes, and so forth." The quantitative literacy score measures a worker's ability "to perform different arithmetical operations, either alone or sequentially, using information embedded in both prose and document formats ... such tasks as entering cash and check amounts onto a bank deposit slip, balancing a checkbook, completing an order form, and determining the amount of interest from an advertisement for a loan."[20]

As is clear from these descriptions, the three literacy areas are not independent of each other. In fact, there is a considerable degree of intertwining among them (i.e., with a correlation coefficient of about .75 between any pair of these literacy measures). Furthermore, it is important to note that prose comprehension appears to be overwhelmingly dominant among the three areas, as a past statistical analysis showed[21]; it seems that this type of literacy underlies each of the other two, suggesting that it is almost like an indicator of basic and comprehensive ability rather than a measure of ability merely in the narrow area of prose comprehension.

This high degree of interdependence among the three indicators of literacy makes it difficult to separate out statistically the net effect of each type of literacy from the

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(e.g., wage rate). [*Because we envision that only the proficiency score contains measurement error, only the upper left corner of this matrix is non-zero.]

A quick calculation, assuming no correlation between literacy and other independent variables, shows that the OLS estimates are biased downward by about four percent.

[20] Kirsch and Jungeblut, op. cit.

[21] This is indicated by the fact that, when subjected to factor analysis, prose comprehension explains the largest amount of variation. See the 1986 NAEP report, Irwin S. Kirsch and Ann Jungeblut, Literacy: Profiles of America's Young Adults, Final Report (Princeton, NJ: Educational Testing Service, September 1986), p. III-6.

effects of other types of literacy -- e.g., to find out the net effect of proficiency in document literacy on wages earned, holding constant the effect of quantitative literacy proficiency. Our approach will be to take each type of proficiency separately and to estimate its impact on wage rate and other indicators of labor market performance. Therefore, it is important to understand that underlying the finding of significant effect of a literacy measure (e.g., document literacy), there is an effect of other literacy measures, albeit they are perhaps not of equal intensity.[22]

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[22] Principal component analysis, applied to a set of three literacy measures together with other variables that are related to literacy (e.g., number of years of schooling, extent of post high-school training, military service experience) yields the first principal component explaining by far the largest proportion of total variation. Also, its main components are three literacy measures with about equal representation (i.e., with the coefficients in the range of .45) of each measure, which indicates that a substantial portion of the three measures moves together. This suggests that whatever each literacy measure is called, there is some underlying basic ability that drives each of the three types of literacy, and this first principal component -- a linear combination of these measures -- may represent this underlying basic ability.

As Richard B. Freeman points out, perhaps an even more serious issue may be that the measured literacy proficiency reflects both "innate" ability ("basic" ability in Freeman's expression) and "acquired" ability (in specific skills in prose comprehension, document literacy, and quantitative literacy, as well as in general skills of critical thinking and information processing). From the policy standpoint, this is an important distinction, since we would be interested in the effects of workplace-literacy training on improving acquired ability; and if possible, we want the regression analysis to shed light on the "value added" of the acquired ability component of the literacy measure. Since, in reality, the two components are not separable (at least not in our data), and innate ability also is a determinant of wages and other indicators of economic well-being, there is an omitted variable bias in the estimated coefficient in our model if it is indeed meant to represent the effects of acquired ability alone. See Richard B. Freeman, "How Much Is Literacy Worth in the Job Market?," Conference on Literacy and the American Worker: Implications for Public Policy, College of William and Mary, Williamsburg, Va., April 1993.

While the problem is evident and highly relevant, its solution is not easy. If there were indexes of innate ability, one such index might be included in a regression -- together with the workplace-literacy proficiency score -- to isolate the effect of acquired ability. However, no measure of innate ability is free from the effects of learned ability. Even the IQ score or any other psychological test cannot escape being influenced by acquired knowledge and ability. What happens in the estimation is explained below:

Taking the hourly wage as the dependent variable, the model is

$$\text{WAGE} = a\text{WLT} + b\text{INNATE} + u,$$

where WLT = ACQUIRED + INNATE.

Any index of innate ability (INDEX) would include acquired ability, thus

$$\text{INDEX} = \text{INNATE} + v \quad \text{where } v = \text{ACQUIRED} + w.$$

The w component of v is not correlated with either WAGE or WLT, but ACQUIRED clearly is. The substitution of INDEX in the estimated equation results in,

$$\text{WAGE} = a\text{WLT} + b\text{INDEX} - bv + u.$$

Thus, in addition to INDEX being correlated with the error term, both WLT and WAGE are correlated with the error term because of the presence of ACQUIRED in v. Furthermore, WLT

The relationship between literacy and various indicators of economic achievement can be discerned from Table 1-1. Educational Testing Service has partitioned the proficiency scores into five discrete groups -- i.e., Level I, 0 to 225; Level II, 226 to 275; Level III, 276 to 325; Level IV, 326 to 375; and, Level V, 376 to 500.[23] The median values of these economic indicators show the averages for each level without being affected by the outliers within each group. Two points are noteworthy from Table 1-1, which presents the results with respect to prose-comprehension scores. (Results are similar with respect to the other two literacy scales -- document literacy and quantitative literacy.)

First, each economic indicator is clearly correlated with level of literacy -- i.e., the higher the level of literacy proficiency, the larger the wages earned and the greater the employment stability. Second, there is a clear break between the lowest two and top two literacy levels in terms of economic achievement. For example, workers at Levels IV and V in prose-comprehension proficiency earned two to three times as much as workers at Levels I and II, and this gap is largely due to the difference in hourly wages and the number of hours worked.

Although it is apparent from this table that literacy is an important variable and explains the variation in these economic indicators, the presence of other explanatory variables, as identified in the preceding section, is suggested by a rather large variation in the wages, weeks worked, hours worked, and annual earnings within each literacy level. Table 1-2 shows that even when the extreme values within each literacy level are ignored by taking the interquartile range, the remaining net variation in literacy is quite considerable. (Again, we examine only with respect to prose comprehension.) In order to gain some idea of the importance of other variables, we adjust observations for gender, Statewide average pay (as an index of regional variation in wages), and State unemployment rate (as an index of variation in economic conditions). While hardly dramatic, the reduction in variation in the value of each economic indicator is noticeable. (See Table 1-3.)

Further, the variables that explain the variation in economic indicators are not necessarily entirely independent of each other In particular, it is likely that variation in literacy proficiency occurs hand-in-hand with variation in one or more of the other explanatory variables. For example, the skill levels of workers are likely to be positively correlated with their literacy levels. In such a case, as illustrated in Table 1-4, a simple examination of hourly wages and other economic indicators by literacy level alone may

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and INDEX are themselves positively correlated. It is clear that by including a new controlling variable, INDEX, a host of compounding technical problems would be introduced which affect the quality of estimated coefficients. So, aside from the fact that no index of "innate" ability is available for the present study, an attempt to separate the effect of the acquired ability from that of the innate ability is not promising.

[23] For a detailed description of these levels of proficiency, see Kirsch, Jungeblut, and Campbell, op. cit., Table 2.2, p. 26. Also, see Appendix Table A-1-3 of this monograph.

Table 1-1: Within-Interval Medians of Economic Indicators -- Prose Comprehension (JTPA and ES/UI Combined)

Literacy Level	Hourly Wage ($)	Weeks Worked per Year	Hours Worked per year	Annual Earnings ($)
I	6.00	32	1,232	7,285
II	6.00	40	1,400	7,560
III	7.00	40	1,560	10,000
IV	9.50	48	1,880	16,203
V	12.00	49	1,976	26,000

Table 1-2: Within-Interval Interquartile Ranges of Economic Indicators -- Prose Comprehension (JTPA and ES/UI Combined)

Literacy Level	Hourly Wage ($)	Weeks Worked per Year	Hours Worked per Year	Annual Earnings ($)
I	3.25	40	1,180	11,430
II	4.00	31	1,440	9,980
III	4.90	28	1,306	13,318
IV	7.50	18	880	17,240
V	13.35	17	940	22,813

Table 1-3: Within-Interval Interquartile Ranges of Economic Indicators (Male, Assume Statewide Average Pay of $205.12 and State Unemployment Rate of 5.48 Percent) -- Prose Comprehension (JTPA and ES/UI Combined)

Literacy Level	Hourly Wage ($)	Weeks Worked per Year	Hours Worked per Year	Annual Earnings ($)
I	3.75	35	1,322	7,425
II	3.33	28	1,114	8,026
III	3.78	24	1,020	9,972
IV	4.87	21	950	12,485
V	8.08	10	801	21,345

Table 1-4: Within-Interval Medians of Economic Indicators (Male, Assume Statewide Average Pay of $205.12 and State Unemployment Rate of 5.48 Percent) -- Prose Comprehension (JTPA and ES/UI Combined)

Literacy Level	Hourly Wage		Weeks Worked per Year		Hours Worked per Year		Annual Earnings	
	(a)* ($)	(b)* ($)	(a)	(b)	(a)	(b)	(a) ($)	(b) ($)
I	5.53	5.91	33	34	1,474	1,574	8,243	9,083
II	5.76	6.14	34	35	1,478	1,518	7,867	8,707
III	6.47	6.84	38	39	1,580	1,620	9,741	10,580
IV	7.63	8.01	41	42	1,710	1,750	11,839	12,678
V	7.15	7.52	45	46	1,922	1,962	15,170	16,010

* (a) Laborer, (b) Operative and Craft.

not yield an accurate picture as to the role of literacy in the economic achievement of workers, since the "effect" of skills may be hidden in the apparent relationship between literacy and economic indicators. Table 1-4 presents the values of the four economic indicators by literacy level, holding constant the effects of gender, Statewide average pay, State unemployment rate, and occupation. The result is that, compared with the results in Table 1-1, the gaps among different literacy levels have narrowed considerably, indicating the indirect workings between literacy and gender, skills, State cost levels, and State economic conditions. These outcomes, together with the intuitive rationale given in the preceding section, point to the merit of the multivariate approach in analyzing the role of literacy.

The explanatory variables that characterize the demand condition for labor (i.e., determinants of the shape and position of the demand curve for labor) will be represented in the statistical analysis as follows:

(a) The Human Capital Content

Human capital content of workers will be proxied, additionally, by occupation groups -- "Technical, Professional and Administrative," "Sales and Clerical," "Operative and Craft," "Service," and "Laborer" -- and by number of years of experience at work. As compared with the broad and "portable" literacy skills measured by the ETS assessment instrument, occupational skills may be thought of as representing industry- or firm-specific skills. In many occupations, the proficiency of workers improves as they accumulate experience on the job, either as a result simply of skill polishing through use or of formal or informal on-the-job training. At the same time, it is commonly observed that such improvement in proficiency tapers off as the years go by, perhaps because there is a limit to the extent to which continued use improves the effectiveness of skills or because both workers and employers are less willing to invest in training to upgrade skills as workers age. This diminishing effect of the on-the-job experience will be accounted for, in the statistical analysis, by a quadratic specification of this variable -- i.e., adding a square term of the number of years on the job.[24]

(b) The Lack of Industry Attachment Data

The lack of industry attachment data, with the corresponding industry information, precludes accounting for the effect of the product-market structure on the demand condition. We will enter State unemployment rates in 1990 as, perhaps, affecting prices of the products. The unemployment rate, however, also affects the supply of labor in specific occupational categories, and it would be difficult to separate its effect on the demand side from its effect on the supply side. In either case, however, a rise in the unemployment rate is expected to have a negative impact on the wage rate by depressing demand as well as by shifting up the labor supplied. However, the effect on the number of weeks or hours worked would be indeterminate since, while its rise would tend to reduce demand for labor through lower product prices, an increase in jobseekers in a given labor market as a result of rising unemployment would tend to increase employment if it is accompanied by lower wage demand by workers.

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[24] This conceptualization of the effects of education, training, and experience is by now a commonly accepted framework of analysis of human capital. See, for example, Jacob Mincer, Schooling, Experience and Earnings, 1974, Ch. 5.

(c) Preference for Work Over Leisure

There are no indexes by which to directly gauge the individual's preference of work to leisure at every amount of time expended for work (or conversely, leisure). There are, however, a number of factors that affect one's relative preference for work over leisure, of which the most important may be the urgency of the need to work. In turn, this is affected, on one hand, by availability of income from sources other than work or by size of asset holdings and, on the other hand, by financial pressure to work. In the present analysis, these factors are represented by four variables: receipt of transfer income, size of family income other than one's own, marital status, and number of household members. Intuitively, one would expect that the greater the amount of income from alternative sources, the less the incentive to work, and that work incentive intensifies with the extent of family responsibility (which is related directly to married status and number of dependents). In this analysis, in the absence of data on dependents, we approximate the number of dependents by the number of household members -- although admittedly this is not the most desirable choice, since the latter includes non-dependent family members. For most of us, as workers, an hour of leisure time has a positive value -- i.e., now and then we enjoy doing nothing or being engaged in non-income-earning activities. Consequently, availability of income from outside sources -- be it public assistance, income of other family members, or any other income -- would be expected to reduce our incentive to work. Thus, collectively for the labor market, transfer income and alternative income sources tend to reduce labor supply. The implication is that wage rates rise and length and intensity of work diminish.

(d) Non-Economic Factors

The relevance of non-economic factors in this analysis was touched upon in a previous section. It suffices to indicate here that the variables of interest in the present analysis are gender, ethnic group, and possession of a high school diploma. In addition, in order to adjust for State-to-State variations in price levels and economic conditions -- variations likely to be reflected in measured labor market success of workers -- the 1990 Statewide average pay of workers and the 1990 State unemployment rates were included. Supposedly, a high school diploma is a certification of a graduate's substantive achievement, which should be reflected in productivity. At the same time, the diploma is frequently the perceived (but not real) evidence of ability in the eyes of employers (e.g., hiring and promotion are often based on this "imagined" productivity). It is this perceived quality of a high school diploma, unrelated to true productivity, that is the focus here. As shown elsewhere in this study, schooling is highly correlated with literacy proficiency; thus, the scholastic achievement represented by diplomas and related to actual productivity is subsumed in literacy scores for analytical purposes.

Table 1-5 is the descriptions and measures of the variables to be included in the present analysis.

3. Estimation of Statistical Model

In this section, the implied hypotheses in the preceding discussion will be tested, and the relative importance of each explanatory variable in labor force performance of unemployed workers will be estimated. It is important at the outset to emphasize that available data are on two specialized populations -- i.e., eligible applicants to the Employment Service and Unemployment Insurance (ES/UI) and to Job Training Partnership Act (JTPA) programs -- and not on the general population of workers. Thus, any inference regarding the relationship between literacy and labor force performance (or, for that matter, between any included variable and labor force performance) to be found in the present analysis should be interpreted with caution.[25] In fact, inasmuch as the behaviors of unemployed workers in these

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[25] In addition to the downward bias caused by measurement error, as discussed earlier, the use of OLS in this sample to describe the general population of workers causes additional downward bias in the estimate of the coefficients in wage equations. This is because compared with average workers, JTPA trainees and ES/UI jobseekers tend to concentrate in the range of relatively lower wages. This happens because the eligibility criteria to participate in the JTPA programs may be closely linked with past wage and employment experiences, the JTPA population contains a large group of disadvantaged and/or dislocated workers, and traditionally job applicants at State Employment Service offices have limited work experience. Thus, drawing a sample from JTPA and ES/UI populations is like drawing a sample from the general population of workers, with a truncation of the wage distribution at a point beyond which no JTPA and ES/UI program participants are observed. This means that the selection into the sample of only JTPA and ES/UI program participants results in a sample consisting overwhelmingly of the individuals who fall below the true regression line (of, say, wages on literacy score) for all workers. In other words, the estimated regression line using this sample would be less steeply-sloped than the true regression line -- or, the estimate of the importance of literacy is downward biased. This problem is reversed in the regression of weeks worked because the observed employment duration in our sample is limited at 52 weeks. In fact, since most employed workers work at or near 52 weeks, it is possible that the "true" regression line may be less steeply-sloped than the regression lines for these two populations. In this case, as an estimate of the literacy-employment relationship in the general population of workers, the regression coefficients in this study would be expected to contain an upward bias. See footnote 29 for more discussion on this issue of censored data.

Table 1-5: Variables Included in the Analysis

Variable	Measurement
Annual Earnings	Dollar value (in logarithm)
Hourly Wage	Dollar value (in logarithm)
Weeks Worked in a 12-Month Period	0-52 (in logarithm)
Hours Worked per Week	0-168 (in logarithm)
Literacy Scores:	
Prose Comprehension	ETS proficiency score, 0-500
Document Literacy	" " " "
Quantitative Literacy	" " " "
Occupation (Skill) -- Yes=1 and No=0 for each occupational class, except Laborer	Technical, Administrative, Sales and Clerical, Operative and Craft, Service, Laborer (Reference Class)
Work Experience	Number of years of work experience
Work Exp. Squared	Square of years of work experience
Income of Others in Household	$ 0- 2,500 (Reference Class)
	$ 2,501- 7,500 (yes=1, no=0)
	$ 7,501-12,500 (yes=1, no=0)
	$12,501-17,500 (yes=1, no=0)
	$17,501-25,000 (yes=1, no=0)
	$25,001-35,000 (yes=1, no=0)
	$35,001-45,000 (yes=1, no=0)
	$45,001 and over (yes=1, no=0)
Public Assistance	Receipt by anyone in household of AFDC, GA, HR, Food Stamps, or other public or private assistance (unemployment compensation or Social Security excluded): Receipt=0; Non-receipt=1
Sex	Male=1; Female=0
Marital Status	Not Married=0; Married=1
Ethnic Group	White (yes=1, no=0)
	Black (Reference Group)
	Hispanic (yes=1, no=0)
	Other (yes=1, no=0)
Household Size	Number of Other Household Members
High School Diploma	Yes = 1; No = 0
Statewide Average Pay	In dollars
State Unemployment Rate (1990)	Percentage

populations are likely to differ from other types of unemployed workers and employed workers, it would be quite untenable to extend findings directly to the general population of workers.[26] Having stated thus, however, we hope that in the absence of information on the general population, the analysis will provide some useful, albeit tentative, insights into the effects of literacy and other relevant variables on the worker's labor force performance.

The analysis here is twofold. First, the relationship between literacy and labor market success will be examined. Analysis of annual earnings will produce a general picture of how literacy may affect the well-being of workers. The analysis is sharpened when the annual earnings variable is decomposed into its components -- i.e., wage rate, length of work, and work-intensity variables -- and the relationship between each variable and literacy is examined. This decomposition will provide a meaningful analysis both conceptually and in terms of policy, in that it identifies the channel through which literacy may affect worker achievements in labor market activities. Secondly, we evaluate, along the lines of the analytical framework presented earlier, the effect on unemployed workers' labor market success of various personal and socio-economic characteristics and of regional conditions.

For a technical discussion of this issue see, for example, G. S. Madalla, Limited Dependent and Qualitative Variables in Econometrics, (Cambridge: Cambridge University Press, 1983), pp. 149-178.

Incidentally, if the purpose of the present analysis is a limited one of describing JTPA and ES/UI populations rather than the general population of workers (i.e., estimating the importance of literacy within these specialized populations), these bias problems are not an issue. Also, if the importance of literacy estimated for the general population of workers using this sample is statistically significant, the implicit downward bias in the wage regression makes the results even more impressive -- i.e., the importance of workplace literacy as demonstrated by use of the sample from the truncated distribution would even be enhanced if adjustment is made for the bias.

[26] Even limiting our inferences to unemployed workers in the study populations, the survey's use of labor-market achievement measures (i.e., earnings, wages, and employment) for the one-year period just prior to literacy assessment may cause some bias, since the time just preceding filing the claim for UI, applying for jobs at ES, and enrolling in a training program, may not represent the typical labor market experience of workers. In addition, dislocated workers, who comprise a substantial segment of these two populations, are not likely to regain the same kind of jobs they held before they came into these DOL programs. This is because for many of them, their accustomed jobs have vanished together with high wages -- as in the case of many former steel workers -- and their future wages may be lower or higher than their previous wages depending on the types of job they find. For them, in other words, the wages and employment experience of the preceding year is not a good indicator of their future productivity or employment stability. To the extent that these workers predominate among DOL client populations, therefore, the estimated relationship between the workers' wages and employment experience and their literacy, based on the reference-period information, could be misleading. A major problem here is that we cannot be certain even of the direction of the bias that might result.

4. Literacy and Labor Market Success

Estimated mean annual earnings were considerably higher among ES/UI participants, with $15,159, than among JTPA participants, with $6,290. The ES/UI population is estimated to be quite diverse with respect to estimated earnings, which ranged from the minimum of $0 to the maximum of $25,900. This compares with the JTPA population, for which annual earnings ranged from $0 to $6,888. These variations among unemployed workers within the respective populations arise from the workings of many factors; and these variations are expected to be reflected in differences in literacy's impact on the labor market performance of workers in the respective populations. In the preceding section, we identified nine relevant factors -- workplace-literacy proficiency scores in prose comprehension, document literacy, and quantitative literacy; gender; ethnic background; occupational reflections of skill level; high school diploma; income of others in a household; receipt of public assistance; Statewide average pay of workers; and the 1990 State unemployment rate.

To state the findings briefly at the outset, regression analysis demonstrates that proficiency in every literacy area (i.e., prose comprehension, document literacy, and quantitative literacy) is highly relevant to the labor market success of ES/UI or JTPA participants. At the same time, there is a wide difference between the two populations in the way literacy proficiency affects labor market achievement. These estimated effects of literacy proficiency are net results of the effects of other explanatory variables that were identified based on conceptual reasoning and were simultaneously entered into the regression estimate of the effects of literacy.[27]

(a) Transformation of Data

Labor market achievement indicators, annual earnings, wage rates, weeks of work in a year, and hours of work per week, were converted into logarithmic values (after 1 is added to each raw value). The regression of the logarithm of a dependent variable on the explanatory variables (not in logarithm) enables us to evaluate the change in percentage terms (after multiplying the regression coefficient by 100) of the dependent variable associated with one unit increase in the value of an explanatory variable -- for example, in a regression of annual earnings on quantitative literacy proficiency, the percentage change in earnings associated with a one-point increase in the quantitative literacy proficiency score from, say, 275 to 276. Categorical variables, such as occupation, were converted into sets of dummy variables such as Occupation Group I (Technical and Administrative) and Occupation Group II (Sales and Clerical), with each level being a dichotomous variable. For example, Occupation Group I is a variable with two values, 1 and 0, indicating whether or not a worker belongs to this occupational group. With a set of dichotomous (dummy) variables, which represents one of the 10 original variables (e.g., occupation), one variable will be left out of the regression to serve as the base with which the effects of others are compared. The regression coefficient for a dummy variable indicates the effect in percentage terms associated with being in the group identified by this variable relative to being in the excluded group. For example, the regression coefficient for Skill Level I indicates the difference in annual earnings in percentage terms of being in a technical or administrative occupation compared with being a laborer -- Skill Level 5 (Laborer) being the base category with which other occupational categories are to be compared. The following are the base categories with which the included categories in the regression are to be compared: Female, Not Married, Black, Laborer, Not Having High School Diploma, and No Household Income Other Than Respondent's.

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[27] In the analyses of this chapter, we exclude schooling, a traditional human capital indicator, from explanatory variables. This is because the "substance" of learning, which is what schooling has been intended to represent, is subsumed in its direct measure in the form of the workplace-literacy proficiency scores available for this study. However, to the extent that years of schooling completed may indicate some non-academic traits -- such as motivation, tenacity, and discipline -- which are likely to have an impact on one's labor market achievement, it is useful to include this variable in the form of some benchmark educational accomplishment. For this reason, a dummy variable indicating whether an individual has a high school diploma or GED is included as an explanatory variable.

(b) Overall Findings

The regression results, presented in Tables 1-6a and 1-6b to explain the variation in annual earnings, are noteworthy on three counts[28]: first, the regression analysis seems to indicate that, for both the ES/UI and JTPA populations, workplace literacy is highly important in determining labor market success. In other words, holding constant the effects of workers' personal characteristics relevant to labor market performance, regression coefficients for literacy-proficiency scores are significantly large (though not in every combination of literacy area and labor market success indicator). Considering that these estimates of the importance of literacy are downward-biased (see footnote 24), this is a conservative assessment of the role of workplace literacy in labor market performance of workers in general.

Second, the regression result indicates a wide difference between ES/UI and JTPA populations in the magnitude of literacy effects on annual earnings and other measures of labor market success, as well as in the types of literacy that are important. While prose comprehension scores for the ES/UI population are highly correlated with annual earnings and with each component of annual earnings, in the JTPA population all three literacy types are significantly correlated with these indicators of labor market performance, and the magnitude of the indicators' estimated effects is larger. For JTPA,

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[28] The regression coefficients for all three literacy measures -- in separate analyses of earnings, wage rate, weeks worked, and hours worked -- are presented in Table 3. Full regression estimates for the three literacy measures, including all explanatory variables, are given in Appendix Table A-1-1.

Table 1-6a: Estimated Percentage Change in Annual Earnings Associated with One-Unit Change in the Explanatory Variable -- Only Individuals with Work Experience in Prior Year

	ES/UI		JTPA	
Explanatory Variable	Change in Earnings (%)	t-score	Change in Earnings (%)	t-score
Prose Comprehension Score	.091	1.402	.313	3.499
Male	10.549	1.869	39.974	4.839
White	3.376	.469	21.308	2.086
Hispanic	3.770	.433	1.754	.098
Other	-37.323	-2.548	-18.940	-.917
Being Married	20.349	3.733	3.940	.518
Household Size	-.170	-.100	-1.152	-.537
Technical & Administrative	31.126	2.964	31.384	1.868
Clerical and Sales	-3.859	-.389	5.676	.419
Operative and Craft	22.640	2.482	19.230	1.641
Service	-10.047	-.932	-17.618	-1.335
High School Diploma	5.444	.933	24.337	3.040
Years of Work Experience	4.458	6.166	2.041	1.712
Years of Work Squared	-.101	-5.762	-.038	-1.119
Statewide Average Pay	-.005	-3.409	.003	1.655
State Unemployment Rate	1.346	.434	-1.468	-.278
Income of Others in Household:				
$ 2,501- 7,500	215.258	1.795	-343.689	-4.348
$ 7,501-12,500	-15.001	-2.136	-9.878	-1.076
$12,501-17,500	-5.324	-.749	-16.765	-1.517
$17,501-25,000	3.843	.426	13.970	1.018
$25,001-35,000	-7.681	-.704	54.313	2.247
$35,001-45,000	-102.997	-7.063	-114.385	-6.185
Not Receiving Welfare	58.487	10.732	27.583	3.408
Constant Term	1,320.499	36.370	1,056.222	17.740
Adj R^2	.240		.160	

Table 1-6b: **Estimated Percentage Change in Annual Earnings Associated with One-Unit Change in the Explanatory Variable -- Including Individuals with No Work in Prior Year**

Explanatory Variable	ES/UI Change in Earnings (%)	ES/UI t-score	JTPA Change in Earnings (%)	JTPA t-score
Prose Comprehension Score	.781	3.370	1.274	3.742
Male	31.310	1.577	139.443	4.280
White	-19.414	-.755	49.565	1.308
Hispanic	-23.345	-.761	61.072	.921
Other	-14.774	-.284	43.881	.546
Being Married	15.802	.825	38.778	1.311
Household Size	-.5370	-.942	-12.896	-1.527
Technical & Administrative	2.888	.077	-130.456	-2.080
Clerical and Sales	-61.284	-1.743	-12.604	-.238
Operative and Craft	17.215	.530	55.167	1.185
Service	-55.697	-1.469	-111.719	-2.186
High School Diploma	33.729	1.641	28.205	.934
Years of Work Experience	1.357	.539	-6.354	-1.465
Years of Work Squared	-.111	-1.864	-.007	-.058
Statewide Average Pay	-.008	-1.693	.001	.137
State Unemployment Rate	-10.234	-.932	-48.062	-2.367
Income of Others in Household:				
$ 2,501- 7,500	-852.895	-3.364	-881.624	-5.798
$ 7,501-12,500	-32.868	-1.320	14.560	.407
$12,501-17,500	-15.000	-.587	1.482	.034
$17,501-25,000	-105.762	-3.382	-114.635	-2.231
$25,001-35,000	24.961	.633	118.304	1.160
$35,001-45,000	-379.577	-8.066	-255.720	-3.735
Not Receiving Welfare	109.776	5.748	237.711	7.509
Constant Term	1,260.814	9.724	833.715	3.619
Adj R^2	.121		.140	

the estimated changes in annual earnings with a one-point increase in proficiency score are 1.274 percent for prose comprehension, 1.248 percent for document literacy, and .974 percent for quantitative literacy; and the corresponding t-scores are 3.74, 3.17, and 2.64 respectively. In comparison, in the ES/UI population only the coefficient for prose-comprehension score is significant, with a value of .781 and a t-score of 3.38. (See Table 1-7.) Thus, literacy is definitely related to the labor market success of unemployed workers in the two Department of Labor client populations, and seems to exert a far greater impact among JTPA trainees than among ES/UI jobseekers -- i.e., the labor market performance of JTPA participants is much more responsive to the literacy level than that of ES/UI program participants. (The distinct way in which literacy is related to JTPA participants' labor market achievements will become clear as we analyze the components of annual earnings.)

Third, a large number of program participants in each population did not have any employment during a one-year period prior to the date of literacy assessment for this survey. They are estimated to comprise over five percent of the ES/UI population and over 20 percent of the JTPA population. Members of the UI population who fall in this category, by the provisions of the UI program, have to be long-term unemployed; this segment of the ES and JTPA populations is composed of either long-term unemployed or new entrants or re-entrants. What is striking is that whether or not these participants are included in the regression analysis makes a dramatic difference in the sensitivity of earnings, wages, and duration and intensity of work to literacy proficiency. Separate regression estimations, including and excluding workers with zero weeks of work, show that labor market success indicators are far more responsive to literacy when these workers are included -- suggesting that those with zero weeks of work are associated with a level of literacy proficiency which is very low and at which wages and employment react very sharply to a slight change in literacy.

Let us elaborate on these three findings. Analysis of annual earnings as an indicator of overall labor market performance becomes much more meaningful when earnings are disaggregated into their component parts -- wage rate and the length and intensity of work. In fact, the picture that emerges when wage rate, weeks worked in a year, and average hours worked per week are separately analyzed is quite revealing.

(1) Literacy as a Predictor of Worker Achievement

The regression result shows that literacy proficiency (especially in prose comprehension) is a powerful predictor not only of overall labor market success, as indicated by annual earnings, but also of performance in the components of overall success. This outcome is quite consistent with the simple hypotheses, spelled out in the discussion of the conceptual model, that literacy as a driving force in labor productivity boosts the demand for labor and ultimately raises both wages earned and probability of employment.

Table 1-7*: Estimated Percentage Changes in Various Indicators of Labor Market Success Associated with One-Point Increase in Proficiency Score

(a) All Observations:

Literacy Area	Annual Earnings (%)	Hourly Wage** (%)	Weeks Worked (%)	Hours Worked (%)
ES/UI:				
Prose	.781	.099	.139	.133
	(3.38)	(3.37)	(2.01)	(2.05)
Document	.172	.112	.000	-.051
	(.74)	(3.80)	(.00)	(.78)
Quantitative	.289	.121	.023	-.075
	(1.19)	(3.95)	(.31)	(-1.11)
JTPA:				
Prose	1.274	.124	.300	.274
	(3.74)	(4.26)	(3.45)	(2.85)
Document	1.248	.109	.345	.385
	(3.17)	(3.16)	(3.37)	(3.47)
Quantitative	.974	.047	.238	.261
	(2.64)	(1.44)	(2.48)	(2.51)

(b) Excluding Individuals With No Work in One Year:

Literacy Area	Annual Earnings (%)	Hourly Wage** (%)	Weeks Worked (%)	Hours Worked (%)
ES/UI:				
Prose	.091	.099	-.014	-.027
	(1.40)	(3.37)	(-.30)	(-.95)
Document	.060	.112	-.008	-.073
	(.925)	(3.80)	(-.17)	(-2.58)
Quantitative	-.087	.121	-.080	-.155
	(-1.28)	(3.95)	(-1.63)	(-5.31)
JTPA:				
Prose	.313	.124	.254	-.042
	(3.50)	(4.26)	(4.16)	(-1.08)
Document	.462	.109	.275	.147
	(4.40)	(3.16)	(3.82)	(3.19)
Quantitative	.250	.047	.188	.055
	(2.52)	(1.44)	(2.79)	(1.27)

(Figures within parentheses are t-scores.)

* Figures in Tables 1-7 through 1-12 are at variance with the corresponding figures in previous tables because a different set of explanatory variables is entered in these regressions. The focus of analysis in Tables 1-7 through 1-12 is the changes in coefficients when literacy is included in the regression.

** Since hourly wages of those with no work in the one-year period are treated as missing values, the regressions for (a) and (b) are identical.

For the ES/UI population, the regression result shows that a one-point increase in any of the three literacy-proficiency scores is associated with an increase of about one tenth of one percent in the hourly wage rate. This means that, for example, a rise in a worker's proficiency score from 250 (a score considered to reflect an inadequate level of literacy in the workplace) to 300 (a score considered adequate though not exemplary) is associated with a five-percent increase in hourly wage rate. Moreover, a one-point increase in prose-comprehension score is associated with .13- and .14-percent increases respectively in hours worked and weeks worked. Apparently, there is a multiplicative effect of literacy among the three components of the aggregate measure of labor market success, making the effect of the whole greater than the sum of the parts; and a change in annual earnings of as large as .8 percent is associated with a one-point change in the prose-comprehension score.

The importance of literacy is even more paramount in the JTPA population as indicated by the pervasiveness and sizes of significant regression coefficients. In all cases except the document-literacy and quantitative literacy scores (which are unrelated to hourly wages), the relationship between literacy and the indicators of labor market success is direct and statistically highly significant. In other words, the high proficiency score in each area of literacy is associated with a correspondingly positive labor market outcome for individual workers -- i.e., high wages and steady employment.

In addition, the extent of the estimated impact of literacy on labor market success is quite large among JTPA trainees, which points to the importance of literacy training as a component of job training. For example, a one-point increase in the document-literacy score is associated with as much as a .34-percent increase in the number of weeks worked. The estimated impact ranges from .13 percent for prose comprehension on hourly wage to .39 percent for document literacy on hours worked.

(2) Different Effects of Literacy on ES/UI and JTPA

Regression results are drastically different between the two populations, suggesting that the mechanism by which literacy proficiency operates on workers' well-being is quite different between jobseekers in the ES/UI system and JTPA trainees. While literacy proficiency seems to have a positive effect only on wages and weeks worked among jobseekers in ES/UI programs, it appears to have positive effects on all aspects of labor market performance among JTPA trainees. In other words, among JTPA participants, literacy proficiency enhances not only their productivity (as reflected in higher wages), but also their employment opportunities, thus making it easier for them to find jobs.

In part, this result may relate to concentration of JTPA trainees in low skill and low education groups, severely limiting their employment horizon but making their employment probability highly responsive to any positive changes in their employability. As Table 1-8 shows, among JTPA participants as much as 37 percent are service- or laborer-occupation workers (of whom 13 percent are laborers) compared with only 20 percent among ES/UI

Table 1-8: **Selected Population Characteristics -- Estimated for 1990**

Variable	ES/UI (%)	JTPA (%)
Male	56.3	41.5
Female	43.7	58.5
Married	43.1	46.4
Other	56.9	53.6
White	62.8	69.2
Black	11.6	20.9
Hispanic	20.2	5.9
Other	5.4	4.0
Technical & Administrative	22.4	11.0
Sales/Clerical	28.3	21.9
Craftsman	28.9	30.3
Service	11.6	24.1
Laborer	8.8	12.8
High School Diploma	76.7	57.6
No High School Diploma	23.3	42.4
On Public Assistance	33.9	61.1
Not On Public Assistance	66.1	38.9
Average Number of Years of Work Experience	13.1	12.2

Source: Compiled using the 1990 DOL workplace-literacy survey data.

program participants. In addition, only 58 percent of JTPA trainees have high school diplomas compared with 77 percent of ES/UI participants. It is possible that such disadvantages in skill and education (and possibly in other background characteristics) result in an extremely narrow range of employment opportunity within which one's ability to find a job is very sensitive to literacy proficiency. This may be why the number of weeks worked is positively correlated, among JTPA trainees, with literacy proficiency scores -- as attested to by the highly significant regression coefficients among JTPA trainees, with t-scores ranging from 2.48 to 4.17.

Among JTPA participants, literacy proficiency is not only highly correlated with both hourly wages and weeks worked, but the estimated size of its impact is quite large. The regression result shows that a one-point increase in a literacy proficiency score is associated with an increase in weeks worked of .24 percent (quantitative), .34 percent (document), and .30 percent (prose). The corresponding effects on hours worked are .27 percent (prose), .38 percent (document), and .26 percent (quantitative). The sizes of the effects on hourly wages are smaller with .13 percent (prose), .11 percent (document), and 0 percent (quantitative). (See Table 1-7.)

In comparison, the statistical results for the ES/UI jobseekers are not as definitive. On one hand, all three types of workplace literacy seem to play an important role in determining the hourly wage -- as seen in highly significant regression coefficients that range between .099 and .121, with t-scores of 3.37 to 3.95. On the other hand, the estimated relationship between literacy and employment measures -- namely, weeks of work and hours worked -- is either far smaller than that among JTPA trainees (as in the case of prose literacy) or statistically not significant (as in the cases of document and quantitative literacy). This outcome may lead us to believe that among ES/UI jobseekers, literacy has little bearing on their employment or job stability and any literacy training is expected to have little effect on increasing their employment stability. However, this conclusion is not necessarily warranted, for two reasons.

First, we need to examine the nature of the data. The presence of a substantial number of individuals who worked a full 52 weeks during the one-year reference period and who scored in the upper range of the literacy scale is likely to have caused a downward bias in the estimate of the extent of change in weeks worked or hours worked as related to change in literacy proficiency. This type of problem is potentially present in both the ES/UI and JTPA populations, but is much more severe for ES/UI because of a far greater number of individuals at the 52-week cap. In fact, whereas 32 percent of ES/UI program participants are estimated to have worked a full 52 weeks, only about six percent of JTPA trainees worked 52 weeks in the reference period. The mean proficiency scores for ES/UI are 293, 286, and 292 in prose, document, and quantitative, respectively, as compared with those for JTPA of 279, 270, and 274. The standard deviations of these scores are also smaller for JTPA than for ES/UI. This means given that literacy and employment are positively correlated, and that observed employment in the data is limited at the maximum of 52 weeks, many more individuals in ES/UI than in JTPA are likely to be capped at 52 weeks of work.

Therefore, the picture we visualize of the two populations is concentration of individuals at the relatively lower segments of both the literacy and the weeks-worked continua for JTPA, and scattering over a wider range -- including a heavy weight of those who worked 52 weeks -- and at a relatively higher level of literacy for ES/UI. If we are to draw a line for each group of scatter points to characterize the relationship between weeks worked and increases in proficiency score, the line for JTPA would be steeper and positioned in the lower range of literacy than that for ES/UI. More importantly, the line for ES/UI would likely be kinked at the top rather than being a straight line all the way, because many individuals have had 52 weeks of work.[29]

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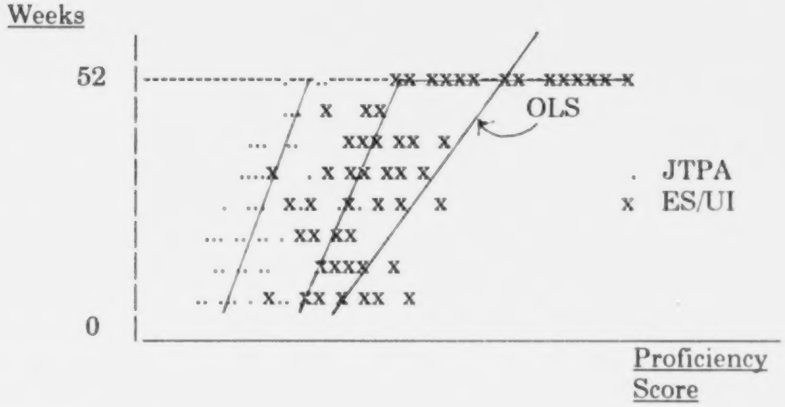
[29] With the mean weeks worked of 36.6 and 21.8 for ES/UI and JTPA respectively, and mean proficiency scores in, say, prose comprehension of 293 and 279 -- together with the standard deviations of 49 and 45 respectively -- the line depicting the literacy-employment relationship for JTPA is located closer to the vertical axis of a scatter diagram and with a steeper slope than the line for ES/UI (and there is a much larger difference among ES/UI jobseekers between the mean proficiency scores of those who worked 52 weeks and the scores of those who worked less -- e.g., in prose, 295 versus 288 for ES/UI and 287 versus 284 for JTPA). Also, because of the difference in the proportion of individuals with a full 52 weeks worked, together with a larger standard deviation for ES/UI, such a line would be considerably less steep for ES/UI than for JTPA. The graph below shows the resulting difference. The OLS estimation forces a straight line on an inherently "kinked" literacy-employment relationship, especially prominent for ES/UI.



So, the resulting regression line would lie below the "true" kinked line of depiction, and it would be less-steeply sloped than the sloping segment of the kinked line. Thus, in order to make use of the information about individuals with 52 weeks of work, the true line should perhaps be calculated for ES/UI using some form of regression for censored data. It would give us a regression

Intuitively, then, it is clear that if we focus on ES/UI jobseekers who did not experience a full 52 weeks of work in the reference period, length of employment is more responsive to literacy (i.e., the regression line is steeper) than the Table 1-7 results indicate. In other words, there are many ES/UI jobseekers for whom training in workplace literacy is not only very useful but also indispensable. This point is not very well conveyed by the analytical results presented in Table 1-7. In fact, a recalculation of the regression model using only those with less than 52 weeks of work yielded larger percentage changes in weeks worked, associated with a unit change in the literacy proficiency score and larger t-scores, than Table 1-7 shows.

Secondly, while document and quantitative literacy did not show a significant relationship with employment measures in the regression results on Table 1-7, prose literacy is highly correlated with employment. Even though document and quantitative literacy measures do not explicitly seem related to employment, there is a high degree of intercorrelation among the three literacy scales (see section B-2 of this chapter), and the document and quantitative measures are vicariously represented in the statistically significant relationship between prose literacy and employment.

The policy implication is that workplace literacy is highly relevant to the employment stability of a large segment of ES/UI jobseekers also. It would seem that many ES/UI jobseekers at the lower range of literacy proficiency, as well as of wages and employment, share traits with JTPA trainees. Therefore, literacy training is equally relevant for these individuals. Nevertheless, the substantial difference that still remains in the size of the impact on weeks worked (and other indicators) between the two populations suggests that in terms of prospective economic well-being, JTPA participants would experience a potentially greater pay-off from intensive literacy training.[30]

(3) Literacy and the Long-term Jobless

Both Department of Labor client populations surveyed contain a substantial number of long-term unemployed workers and new entrants and re-entrants. The ES/UI participant sample contains about five percent who had no jobs during the one-year period prior to the literacy assessment; over 20 percent of the JTPA-eligible applicants in the sample had no jobs in the same period.

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line somewhere between the two lines shown here. Because the number of those with 52 weeks worked is small, this adjustment would not make much difference for JTPA.

[30] The large difference between the two populations, combined with the fact that JTPA participants are concentrated in an earnings range far below the range of ES/UI jobseekers, suggests that the two populations are at distinct parts of the earnings spectrum and, further, that the marginal effect of literacy on labor market success declines with earnings.

Because we suspected that these long-term jobless workers and new entrants are inherently different in the way their labor market activities and performance responded to some of the strategic variables, separate analyses were done for the entire populations and for the populations excluding those who had no work experience during the one-year period. The results are rather dramatic.

As Table 1-7 shows, the most remarkable finding is that both weeks worked and hours worked, and hence annual earnings also, are in most cases far more responsive to literacy proficiency when the analysis includes all program participants than when those with no work experience in the preceding one-year period are excluded. (Analysis of hourly wages includes only those with work experience, for obvious reasons.) Among jobseekers in the ES/UI system, neither weeks worked nor hours worked is found sensitive to any type of literacy when the analysis is limited to individuals who had jobs in the reference period; however, both of these labor market success indicators turn highly responsive to changes in prose-comprehension score when analysis includes all program participants. Concomitantly, annual earnings become responsive to changes in prose comprehension. Among JTPA trainees, all labor market success indicators, which in most cases are highly responsive to the three measures of literacy among individuals who had work experience in the reference period, become even more responsive to changes in literacy scores when those with no jobs in the reference period are included in the analysis. For example, while a one-point increase in prose-comprehension score is associated with only a .31-percent increase in annual earnings in analysis limited to those with work experience in the prior year, as much as a 1.3-percent increase in annual earnings is observed -- corresponding with the same amount of increase in prose-comprehension score -- in analysis that includes all JTPA participants.

This drastic difference in regression coefficient between the two approaches to the analysis indicates that ES/UI and JTPA participants with no work experience in the preceding one-year period are clustered at far lower literacy-proficiency levels, once effects of personal characteristics and other variables are controlled, than other participants.[31]

This is potentially a very meaningful result in pointing to the special problems of the workers who suffer from long-term joblessness in that their disadvantage in the labor market is attributable in large measure to the deficiency in workplace literacy. It indicates that regardless of skill category, ethnic group, or any other personal characteristics related to employment performance, those who undergo extensive joblessness tend to be sharply disadvantaged among their peers in terms of literacy. In other words, the probability of finding a job, as against not working, is highly sensitive to literacy. It follows, then, that serious consideration should be given to making literacy training an integral part of the assistance provided to jobseekers with little or no recent work experience.

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[31] Admittedly, the estimated coefficients for regression, including the individuals with no work experience in a one-year period, are subject to bias, since we applied the OLS regression on these censored data. However, whatever bias that may exist would be downward, and any adjustment would only reinforce our argument here. A comparison of the OLS and Tobit results supports this view. (See Appendix Table A-1-2, which presents the results of the OLS and Tobit calculations.)

5. Worker Characteristics and Labor Market Success

The regression analysis took account of other variables that may impact on workers' labor market success and are likely to be correlated with literacy proficiency. (See Table 1-8.) Inclusion of these variables in the regression enabled us to estimate the effect of literacy apart from them. Analysis of these variables is useful for two reasons: Examination of the sizes of the regression coefficients for these variables vis-à-vis those for literacy proficiency will enable us to grasp the relative importance of literacy and other strategic factors in determining the labor market performance of unemployed workers; and the regression coefficients of these variables by themselves are useful indicators of their relative importance.[32]

Earlier, we explained how these variables may affect the labor demand or supply function, implying that both observed wage rate and employment, which were simultaneously determined by these functions, were affected by each of them. For this reason, all of those variables are included in regression analysis of hourly wages, weeks worked, and hours worked. It must be emphasized, however, that the weeks-worked figure obviously is not the same as a point on a labor supply function (in the sense that the wage-rate figure can be regarded as representing a point on a demand function for labor), since anyone's duration of work is a result of a series of week-to-week market outcomes determined by the condition of demand and supply for each day. In addition, whereas a wage rate is a "given" to a group of workers in the same skill group or occupation, a number of factors specific to the individual worker play a large role in determining his or her work or non-work outcome for each day or week. For this reason, it is possible that a force such as increased literacy, which raises productivity, may not bring about the observed outcome expected from conventional analysis, where both wages and employment would rise.

(a) Relative Importance of Literacy

We will now evaluate for various facets of labor market success the importance of literacy compared with other strategic variables. Educational Testing Service, the creator of the test instrument used for literacy assessment in the Department of Labor survey, devised a grouping of proficiency scores into five levels, with a 50-point interval for the middle three classes. (The lowest level ranges from 0 to 225, and the highest level ranges from 376 to 500.) Here, let us evaluate the changes in labor market success indicators associated with a 50-point change in each of the three literacy scores -- prose comprehension, document literacy, and quantitative literacy.[33]

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[32] Schooling is excluded from this analysis for two reasons: First, given a high correlation between schooling and literacy proficiency (see next chapter), this variable as a measure of the substance of learning is subsumed in the literacy-proficiency scores. Second, schooling, as a credentialling index unrelated to one's substantive knowledge, is better represented by whether or not one has a diploma -- be it high school or college. This is because employers usually ask whether a job applicant has a diploma instead of asking about the years of schooling. In the present analysis, a high school diploma is entered to represent this credentialling effect of schooling.

At the outset, as Tables 1-9a, b, c, d, and e show, we point out that not every facet of labor market success is significantly related to every type of literacy proficiency. As we indicated earlier, it is particularly noteworthy that among jobseekers who go through the Employment Service and Unemployment Insurance systems, the effects of literacy proficiency of every type manifest themselves primarily in wage rates -- although prose comprehension is correlated also with weeks worked and hours worked. This is in sharp contrast to the way literacy works for JTPA trainees, among whom literacy proficiency is strongly correlated not only with wage rate, but also with weeks worked and even with hours worked per week.

Among ES/UI program participants, a 50-point jump (enough for shifting from one literacy level to the next) in prose-comprehension score is associated with a five percent increase in hourly wage.[34] Thus, the gain in wage rate associated with a jump from one literacy level to the next higher level is large enough to offset the white-black difference (estimated to be 4.3 percent), is comparable to the gains obtained from an additional 2.5 years of work experience (i.e., 2.5 times 2.147 percent minus 6.25 times .039), and is almost equal to the advantage a high school diploma produces over not having a diploma (i.e., 5.89 percent). Separate regression analyses were carried out for document and quantitative literacy scores, and the results are quite similar except that the effects of document and quantitative literacy are markedly greater than those of prose comprehension.[35] With respect to number of weeks worked, the advantage of having a high school diploma (almost five percent more weeks of work than without a diploma) would be outweighed by a 50-point

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[33] See the final report on the survey of the ES/UI and JTPA participant populations by Educational Testing Service, op. cit. The description of five proficiency levels by ETS is reproduced in Appendix Table A-1-3 in this study.

[34] Because the three literacy types are closely correlated, a jump in prose-comprehension score is likely to occur hand-in-hand with a jump in the other two literacy scores. In other words, a five percent rise in wage rate, estimated here, is not an estimated net effect of prose-comprehension proficiency alone. The estimated correlation coefficients among the three literacy measures are: .7712 between prose and document, .7382 between prose and quantitative, and .7936 between document and quantitative.

[35] Replacing the prose-comprehension score for document and quantitative literacy scores in respective regressions changes the coefficients of other variables slightly. See Appendix Table A-1-1 for regression estimates where document and quantitative literacy scores have been entered in place of prose-comprehension score.

Table 1-9a: **Estimated Percentage Change in Hourly Wage with One-Unit Change in the Explanatory Variable -- Regression Results**

Explanatory Variable	ES/UI Change in Hourly Wage (%)	ES/UI t-score	JTPA Change in Hourly Wage (%)	JTPA t-score
Prose Comprehension Score	.100	3.371	.124	4.259
Male	17.739	6.924	13.325	4.913
White	4.301	1.324	.517	.154
Hispanic	6.556	1.679	16.630	2.838
Other	6.932	1.042	-7.283	-1.073
Being Married	9.863	.401	-1.339	-.537
Household Size	2.298	2.999	-1.152	-.897
Technical & Administrative	21.990	4.648	25.446	4.674
Clerical and Sales	2.212	.495	1.320	.297
Operative and Craft	5.288	1.291	9.146	2.372
Service	-16.233	-3.347	-16.043	-3.695
High School Diploma	5.890	2.238	3.469	1.321
Years of Work Experience	2.147	6.591	1.503	3.843
Years of Work Squared	-.039	-4.923	-.024	-2.156
Statewide Average Pay	.002	4.091	.000	1.489
State Unemployment Rate	.272	.195	-2.685	-1.562
Income of Others in Household:				
$ 2,501- 7,500	172.118	3.154	-29.689	-1.142
$ 7,501-12,500	-8.842	-2.798	-7.611	-2.522
$12,501-17,500	-4.058	-1.253	-7.361	-2.028
$17,501-25,000	-3.852	-.942	3.535	.787
$25,001-35,000	-19.805	-3.996	2.913	.366
$35,001-45,000	-20.548	-3.100	-24.017	-3.950
Not Receiving Welfare	20.143	8.165	14.258	5.362
Constant Term	504.997	30.825	560.482	28.716
Adj R^2	.272		.232	

Table 1-9b: Estimated Percentage Change in Weeks Worked with One-Unit Change in the Explanatory Variable -- Regression Results (All Program Participants)

Explanatory Variable	ES/UI Change in Weeks Worked (%)	ES/UI t-score	JTPA Change in Weeks Worked (%)	JTPA t-score
Prose Comprehension Score	.139	2.012	.300	3.450
Male	-2.963	-.498	33.942	3.961
White	-8.427	-1.083	9.353	.947
Hispanic	-1.503	-.163	-2.829	-.162
Other	-13.997	-.897	11.082	.539
Being Married	15.898	2.765	15.797	2.039
Household Size	-1.917	-1.124	-2.461	-1.100
Technical & Administrative	1.648	.148	-17.412	-1.067
Clerical and Sales	-10.706	-1.016	10.094	.725
Operative and Craft	7.837	.805	14.330	1.170
Service	1.354	.119	-4.188	-.314
High School Diploma	4.928	.796	11.521	1.462
Years of Work Experience	.690	.913	-1.976	-1.740
Years of Work Squared	-.040	2.221	.008	.269
Statewide Average Pay	-.005	-3.628	.002	.803
State Unemployment Rate	-3.240	-.995	-16.885	-3.210
Income of Others in Household:				
$ 2,501- 7,500	-246.191	-3.154	-245.880	-6.105
$ 7,501-12,500	-3.758	-.507	-1.389	-.147
$12,501-17,500	-4.735	-.619	-15.241	-1.352
$17,501-25,000	-26.106	-2.749	-18.730	-1.392
$25,001-35,000	16.854	1.418	56.618	2.108
$35,001-45,000	-132.762	-9.412	-108.478	-6.099
Not Receiving Welfare	46.590	8.077	67.384	8.152
Constant Term	397.223	10.141	190.134	3.142
Adj R^2	.131		.140	

Table 1-9c: Estimated Percentage Change in Weeks Worked with One-Unit Change in the Explanatory Variable -- Regression Results (Excluding Participants with No Work in the One-Year Reference Period)

	ES/UI		JTPA	
Explanatory Variable	Change in Weeks Worked (%)	t-score	Change in Weeks Worked (%)	t-score
Prose Comprehension Score	-.014	-.307	.254	4.162
Male	-8.122	-2.000	16.337	2.873
White	-2.069	-.396	2.172	.311
Hispanic	5.469	.868	-18.627	-1.512
Other	-20.257	-1.920	-9.398	-.658
Being Married	17.328	4.417	6.008	1.156
Household Size	-.999	-.819	1.091	.734
Technical & Administrative	9.947	1.321	10.680	.945
Clerical and Sales	5.074	.713	8.062	.865
Operative and Craft	10.764	1.645	5.980	.744
Service	11.562	1.491	18.518	2.052
High School Diploma	-.529	-.126	14.049	2.564
Years of Work Experience	1.193	2.287	-.577	-.706
Years of Work Squared	-.035	-2.754	.014	.592
Statewide Average Pay	-.005	-5.095	.004	2.536
State Unemployment Rate	-.951	-.432	-5.742	-1.608
Income of Others in Household:				
$ 2,501- 7,500	-5.661	-.064	-299.933	-5.771
$ 7,501-12,500	-3.323	-.657	-2.963	-.467
$12,501-17,500	-3.007	-.586	-17.809	-2.356
$17,501-25,000	1.951	.297	8.487	.886
$25,001-35,000	8.846	1.121	42.474	2.552
$35,001-45,000	-71.982	-6.907	-89.097	-7.169
Not Receiving Welfare	36.231	9.179	21.678	3.904
Constant Term	422.228	16.024	155.893	3.788
Adj R^2	.133		.133	

Table 1-9d: **Estimated Percentage Change in Hours Worked with One-Unit Change in the Explanatory Variable -- Regression Results (All Program Participants)**

	ES/UI		JTPA	
Explanatory Variable	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Prose Comprehension Score	.133	2.049	.273	2.845
Male	7.894	1.434	36.322	3.941
White	-1.361	-.187	20.607	1.918
Hispanic	-14.898	-1.716	16.986	.911
Other	-6.074	-.420	11.906	.524
Being Married	1.101	.204	12.884	1.545
Household Size	-1.966	-1.220	-4.309	-1.797
Technical & Administrative	-7.362	-.703	-55.459	-3.138
Clerical and Sales	-24.453	-2.486	-16.948	-1.131
Operative and Craft	2.812	.309	9.447	.721
Service	-22.184	-2.083	-43.878	-3.052
High School Diploma	9.080	1.566	4.980	.584
Years of Work Experience	.506	.715	-1.546	-1.263
Years of Work Squared	-.035	-2.099	-.010	-.280
Statewide Average Pay	-.003	-2.077	-.000	-.332
State Unemployment Rate	-.796	-.258	-11.179	-1.948
Income of Others in Household:				
$ 2,501- 7,500	-239.461	-3.321	-219.510	-5.064
$ 7,501-12,500	-10.308	-1.965	5.587	.553
$12,501-17,500	-5.050	-.705	6.619	.544
$17,501-25,000	-25.376	-2.869	-37.626	-2.576
$25,001-35,000	8.588	.772	23.570	.810
$35,001-45,000	-78.466	-6.013	-36.830	-1.937
Not Receiving Welfare	18.788	3.478	54.043	6.038
Constant Term	376.518	10.306	273.394	4.184
Adj R^2	.094		.118	

Table 1-9e: **Estimated Percentage Change in Hours Worked with One-Unit Change in the Explanatory Variable -- Regression Results (Excluding Participants with No Work in the One-Year Reference Period)**

	ES/UI		JTPA	
Explanatory Variable	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Prose Comprehension Score	-.027	-.948	-.042	-1.082
Male	2.790	1.134	8.689	2.392
White	3.208	1.020	15.702	3.490
Hispanic	-8.667	-2.274	2.460	.316
Other	-17.598	- 2.770	-3.056	-.336
Being Married	2.217	.929	2.648	.796
Household Size	-.840	-1.128	-1.322	-1.398
Technical & Administrative	.489	.107	-12.849	-1.750
Clerical and Sales	-9.255	-2.161	-9.384	-1.578
Operative and Craft	4.623	1.175	-1.139	-.223
Service	-7.789	-1.667	-20.071	-3.494
High School Diploma	8.700	.342	4.461	1.271
Years of Work Experience	1.279	4.088	.956	1.832
Years of Work Squared	-.329	-4.329	-.024	-1.632
Statewide Average Pay	-.002	-3.185	-.000	-.662
State Unemployment Rate	2.370	1.761	3.194	1.380
Income of Others in Household:				
$ 2,501- 7,500	41.921	.789	28.797	.820
$ 7,501-12,500	-4.757	-1.554	-3.198	-.079
$12,501-17,500	-1.434	-.458	4.326	.890
$17,501-25,000	4.630	1.167	-3.187	-.053
$25,001-35,000	1.128	.236	9.070	.845
$35,001-45,000	-4.732	-.757	7.991	1.010
Not Receiving Welfare	4.377	1.829	-6.209	-1.748
Constant Term	389.056	24.544	348.073	13.266
Adj R^2	.094		.043	

jump in the prose comprehension score -- an increase estimated to yield almost a 7-percent increase in weeks worked. (See Table 1-9b.)

As regards hours worked, one would think that the number of hours worked indicates, to a large extent, intensity of work as a function of motivation and ability to work, on one hand, and regularity of work available, on the other. The latter is a function of the market demand for labor, as determined by positions and shapes of the demand and supply functions, and the type of work. Seen in this light, it would seem that proficiency in literacy of any type should be at least neutral in variation in hours worked, if not positively related. The analysis that includes all program participants (i.e., those who had work experience in the prior one-year period as well as those who did not have any work) bears out this expectation with large positive coefficients for hours worked in both populations. Specifically, this result indicates that, for each one-point increase in prose-literacy score, the hours worked would increase by .13 percent (ES/UI) and .27 percent (JTPA). This means that a jump from the mid-point of one literacy level to that of the next higher level (e.g., Level I to Level II) by a 50-point boost in proficiency score improves hours worked per week by 6.5 and 13.5 percent respectively. In the case of JTPA, furthermore, both document literacy and quantitative literacy are highly correlated with hours worked, with a one-point increase in proficiency score being associated with .33-percent and .26-percent increases, respectively.

The outcome of the analysis of only those program participants with work experience in the one-year reference period is less clear-cut. Among ES/UI program participants, both document and quantitative literacy are negatively correlated with hours worked; and, among the JTPA participants, only document literacy is significantly and positively correlated with hours worked. We can only speculate about this seemingly contradictory result. It may be that many of the relatively high-paying jobs the jobseekers in the ES/UI system had previous to their unemployment were of an irregular and part-time nature, so that given a fairly substantial representation of managerial, professional, and administrative occupations among ES/UI participants (22 percent as compared with 11 percent among JTPA trainees), the consequent negative correlation between wage rate and hours worked may be showing up in this result. In any event, to the extent that this indicates involuntary curtailment of hours worked by workers with high levels of proficiency in document and quantitative literacy, it indicates a waste of human capital.

A quite different picture emerges among JTPA trainees, the most notable difference being the importance of literacy on number of weeks worked in one-year periods preceding application for JTPA training. Again using a 50-point increment in the proficiency scores, shifting from, say, Level II to Level III in prose comprehension among the five literacy levels would be associated with a 15-percent increase in number of weeks worked. Since, according to ETS, proficiency at Levels I and II is quite limited for performing satisfactorily in the workplace[36], this is quite consonant with what one would expect. The estimated effect of prose-comprehension proficiency compares with an estimated 11.5-percent difference in weeks worked, associated with whether a JTPA trainee has a high school diploma. The estimated effects of the other two types of literacy on weeks worked is as dramatic. A 50-point increase in document-literacy score would increase weeks worked by 17 percent, while a similar increase in quantitative literacy score would increase weeks worked by 12 percent.

Average hourly wages of JTPA trainees, earned during the one-year period prior to participation, are also sensitive to literacy proficiency. The regression estimates indicate that a 50-point jump in the prose-comprehension and document-literacy scores is associated with increases of six percent and 5.5 percent, respectively, in the wage rate. Among JTPA trainees, this is more than the advantage gained by possession of a high school diploma, which is about 4 percent.

The different way in which literacy is related to labor market performance in the two Department of Labor client populations suggests that these populations are fundamentally different with respect to strategic characteristics related to the labor market performance of workers. (See Table 1-10 for a comparison of the two populations in terms of estimated mean hourly wages and weeks worked by ethnic group.) Nevertheless, for both populations, as attested to by large and statistically significant coefficients in the hourly-wage regressions, literacy-proficiency scores are closely related with productivity of workers -- if the scores are not an indicator of productivity themselves.

(b) Importance of Other Strategic Variables

We have earlier identified several variables of importance from a conceptual description of how workers' success in labor market activities is determined. Subsequently, we selected statistical measures of these variables. Now, we test how our expectations of the effects of the variables is borne out in the actual labor market and, more importantly, whether and how their estimated roles change once the effects of literacy are accounted for explicitly. There are three types of variables included in this analysis: human capital variables – those that pertain primarily to the demand for labor through their effect on labor productivity (both real and imagined on the part of the employer), including skill level, possession of a high school diploma, and years of work experience; personal characteristics that are "givens" to the worker, such as gender and ethnic background; and variables that affect workers' labor force participation decisions, including marital status, household size, income of others in the household, and whether or not anyone in the household receives any welfare payment (see earlier discussion in this chapter for the conceptual

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[36] See Kirsch and Jungeblut, op. cit. Also, there seems to be a clear break at a score of around 300, with respect to each literacy type, in terms of such indicators as poverty threshold and the minimum wage rate. This is consistent with ETS' position.

Table 1-10: Estimated Mean Hourly Wages and Weeks Worked -- by Ethnicity

	ES/UI		JTPA	
	Hourly Wage ($)	Weeks Worked	Hourly Wage ($)	Weeks Worked
White	9.69	38.04	5.88	22.77
Black	6.74	34.45	4.87	16.21
Hispanic	8.16	33.44	6.23	18.82
Asian/ Pacific Islanders	11.78	31.49	5.31	17.16
American Indian	6.64	33.00	5.37	18.08
Other	8.56	33.52	7.08	27.04

rationale of including these types of variables in the analysis.) In addition, in order to adjust for regional variations in economic conditions and wage levels, which are likely to be reflected in variations in observed wage rate and employment, Statewide average pay and 1990 State unemployment rate are entered in each regression.

(1) Hourly Wage

The results of hourly-wage regressions are mixed -- i.e., signs of the coefficients of some explanatory variables are consistent with expectations, and others are statistically not significant or are of an opposite sign.[37] (See Tables 1-9a, b, c, d, and e.) First, the regression outcome regarding human capital variables is revealing. It is reasonable to think that much of the labor market advantage associated with variables such as skills, high school diploma, and work experience is due to the literacy content ingrained in these variables. At the same time, it is likely that these variables themselves have inherent properties that affect demand for and supply of specific types of labor. For example, scarcity of certain technical workers relative to the currently available pool of these workers tends to raise wages in the technical and administrative skill group relative to other groups. This is the effect of the unique structure of the labor market for this type of worker. Further, we have already touched upon another example, the "credentialling" effect of a high school diploma. Thus, once the effect of literacy is removed from these variables, their impact on labor market success indicators may be substantially reduced (although quite possibly residual effects may remain).

In order to assess these residual effects and the extent of literacy in variables among ES/UI program participants, we ran two regressions -- one with prose-comprehension score (a literacy variable) included as an explanatory variable of hourly wage and the other excluding the score. The analysis excluding the literacy variable would yield a picture of the gross effect of variables such as skill, high school diploma, and experience, and the analysis including the literacy variable would give us a picture of the effects of these variables on hourly wages apart from the effect of literacy. The results confirm our expectations. In the analysis excluding the literacy variable, the coefficients for high skill occupation groups, for jobseekers with a high school diploma, and for years of experience, are large and highly significant. (See Table 1-11.) But, once the literacy variable is introduced into the analysis, these coefficients are reduced considerably. Among occupational groups, with prose-comprehension score excluded from the analysis, Technical and Administrative occupations are associated with almost a 26-percent higher hourly wage than the Laborer occupation. With prose-comprehension score entered, this advantage declined to about 22 percent. For Operative and Craft occupations, the corresponding change is from about 8 percent to 5 percent. Apparently, Service occupations on the average are less remunerative than the Laborer occupation -- i.e., a 10-percent-less hourly wage for the former than the latter.[38] This disadvantage is exacerbated when the effect of literacy is accounted for -- i.e., a 16-percent-lower hourly wage for Service occupations than for the Laborer occupation. (See Table 1-11.) These enormous changes (declines) in the importance of occupational skills among jobseekers in the ES/UI system, when the effects of literacy are isolated out, suggest that underlying any skill of the experienced workers heavily represented in this population, there is a large component of general (and portable) skill -- more aptly classified as workplace literacy.

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[37] The same set of explanatory variables are entered in separate regressions with three literacy proficiency scores -- prose comprehension, document literacy, and quantitative literacy. The estimated coefficients for these explanatory variables vary among the three regressions but, as one would expect, not substantively. So, discussion of the regression model including one literacy type will suffice in evaluating the importance of other explanatory variables. Discussion in this section focuses on results from prose-comprehension regression. Regression results, including the other two literacy scores, are included in Appendix A-1-1.

This finding has a significant policy implication with regard to jobseekers in the ES/UI system. Namely, in order to bring these workers into productive and stable employment, training them in narrowly-defined job skills is not enough. They must also be given training in workplace literacy of the type the ETS test instrument has assessed -- i.e., literacy education that goes beyond the traditional three R's and stresses reasoning, synthesizing, and deduction.

While occupational skills are important among JTPA program participants also, it is striking that the direction of change is opposite that for ES/UI. (See Table 1-12.) Specifically, the coefficients for the Technical and Administrative, Operative and Craft, and Service groups, which are statistically significant, are larger when the effects of literacy are isolated out. Compared with the hourly wage of the Laborer occupation, the wage of the Technical and Administrative group was 12 percent higher, that of the Operative and Craft group almost 9 percent higher, and that of the Service group 21 percent lower when the effects of literacy were not explicitly included. Inclusion changes these occupational effects to 25 percent, over 9 percent, and -16 percent respectively. This is a somewhat surprising result and perhaps indicates a fundamental difference between ES/UI jobseekers, who are predominantly experienced workers, and JTPA trainees, who are composed to a large extent of long-term unemployed workers and new entrants. (Recall that about five percent of the ES/UI jobseekers in the sample had not held any job during a one-year period preceding the survey while as much as 20 percent of the JTPA participants were in this category.) This result raises the possibility that the skills represented by the technical, administrative, and service occupations held before the current spell of joblessness by JTPA trainees are largely of a narrow job-specific type with little general and portable skill content. If this is true, it follows that focused literacy training of long-term unemployed JTPA trainees in high skill occupational categories would enhance their productivity and hence their wages.

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[38] While each occupational group under this rough categorization is composed of heterogeneous skills, the skills in the Service occupation group are particularly wide-ranging. For this reason, the results with respect to Service occupations need to be interpreted with caution.

Table 1-11: Estimated Percentage Change in Hourly Wage, with One-Unit Change in the Selected Explanatory Variable -- ES/UI Population

Explanatory Variable	Holding Literacy Fixed		Excluding Literacy	
	Change in Hourly Wage (%)	t-score	Change in Hourly Wage (%)	t-score
Prose Comprehension Score	.100	3.371	-	-
Male	17.739	6.924	13.165	5.776
White	4.301	1.324	8.326	2.998
Hispanic	6.556	1.679	8.325	2.339
Other	6.932	1.042	1.887	.317
Technical & Administrative	21.990	4.648	25.895	6.051
Clerical and Sales	2.212	.495	6.220	1.537
Operative and Craft	5.288	1.291	7.812	2.102
Service	-16.233	-3.347	-10.260	-2.381
High School Diploma	5.890	2.238	10.556	4.506
Years of Work Experience	2.147	6.591	2.210	7.797
Years of Work Squared	-.039	-4.923	-.042	-6.553

Table 1-12: Estimated Percentage Change in Hourly Wage, with One-Unit Change in the Selected Explanatory Variable -- JTPA Population

	Holding Literacy Fixed		Excluding Literacy	
Explanatory Variable	Change in Hourly Wage (%)	t-score	Change in Hourly Wage (%)	t-score
Prose Comprehension Score	.124	4.259	-	-
Male	13.325	4.913	7.19	2.36
White	.519	.154	1.34	.36
Hispanic	16.630	2.838	16.55	2.50
Other	-7.283	-1.073	-9.16	-1.25
Technical & Administrative	25.446	4.674	11.69	1.91
Clerical and Sales	1.320	.297	3.24	.62
Operative and Craft	9.146	2.372	8.72	1.91
Service	-16.043	-3.639	-20.67	-4.07
High School Diploma	3.469	1.321	3.78	1.31
Years of Work Experience	1.503	3.843	1.84	4.86
Years of Work Squared	-.024	-2.156	-.04	-4.00

The change in the regression coefficient between the two analyses is even more dramatic among ES/UI jobseekers, with respect to whether a worker has a high school diploma -- i.e., from 10.6 to 5.9. This indicates that once the literacy variable controls for substantive productive capacity or knowledge, which the possession of a high school diploma is purported to represent, the effect of having a diploma declines sharply -- i.e., a diploma being associated with 11 percent more wages than without a diploma falls to 6 percent more than without. At the same time, however, it should be noted that at 5.9 percent, the coefficient is still statistically highly significant and large, suggesting that the "credentialling" effect -- whereby a high school diploma "signals" to the employer the presence of other characteristics that enhance productivity (e.g., drive, motivation and perseverance) -- is a potent force in determining wages. This is why graduating from school is so important in the job market. The estimated effect of the years of work experience does not change as spectacularly with the inclusion of the literacy variable, although the coefficient does decline somewhat. This may indicate that the kind of skill workers get from their years on the job is different from ability that is measurable -- e.g., specific technical skills, motivation, and familiarity with work environment. In contrast, holding of a high school diploma apparently makes little difference among JTPA participants, as indicated by the coefficient that is statistically not significant in either regression.

Second, among personal characteristics, gender difference is important. With the effect of literacy separately accounted for, men earned 18 percent (ES/UI) and 13 percent (JTPA) more than women. However, the effect of ethnic difference is indeterminate when the effect of literacy is accounted for separately. What is notable is that the estimated effects of gender and ethnic difference on hourly wages vary drastically depending on whether the effects of literacy are explicitly recognized in the analysis. Again, referring to Tables 1-11 and 1-12, which present the results of regression with selected variables, it is apparent that there are significant literacy gaps between males and females and among ethnic groups. With the literacy variable excluded from the analysis, males earned a 13-percent higher hourly wage than females as compared with 18 percent more when the literacy variable is included. This implies that male jobseekers in the ES/UI system are advantaged in the labor market despite their disadvantage in literacy relative to female jobseekers; thus when literacy is held constant, the male-female gap in the hourly wage widens. The corresponding shift among JTPA participants is from 7 percent to 13 percent, thus showing an even greater literacy deficiency of males than females.

In comparison, the white-black difference in the ES/UI population, as shown by the 8-percent gross advantage of whites over blacks in hourly wage, is to a substantive degree attributable to the literacy gap. This is consistent with the decline in the gap to 4 percent when literacy is included in the analysis.[39] A similar though lesser tendency exists in the Hispanic-black difference. Thus one meaningful approach toward correcting differences in labor market success among ethnic groups would be intensive literacy enhancement of disadvantaged workers.

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[39] This is consistent with Lynch's finding regarding the effect of schooling, which is a major determinant of workplace literacy (see Chapter II) on the white-nonwhite wage gap. Lisa M. Lynch, "The Impact of Private Sector Training on Race and Gender Wage Differentials and the Career Patterns of Young Workers," Final Report to the U.S. Department of Labor, July 1991,

Third, the results for the last set of variables do not support our initial expectation. One would expect, on one hand, that the increased family responsibility normally associated with being married or having dependents should stimulate the work incentive. The resultant increase in labor supply would, holding other things constant, have a wage depressing effect. Availability of alternative sources of income, on the other hand, would tend to relieve the pressure of having to work, thus prompting a work disincentive which would push up wages. In neither population is Being Married significantly correlated with Hourly Wage. Household Size is positively correlated with Hourly Wage in the ES/UI population. Both outcomes are contrary to what we would expect based on the simple economic reasoning above. In both populations, the relationships of Hourly Wage with Income of Others in Household and with Non-Receipt of Welfare are significant, but again the directions of the relationship are the opposite of what we would expect. The most likely explanation of this outcome is that these variables are not appropriate measures of financial pressure and relief associated with individuals in the studied populations.

A possible explanation is that Household Size is possibly correlated with financial pressure associated with the presence of dependents, driving workers to seek high-paying jobs. While this effect is accounted for to some extent by occupational groups, the broadness of each occupational group, within which the wages paid vary widely, may be permitting this wage effect to show up in the household-size variable. In addition, large household size reported does not necessarily mean that the respondent is head of the family. It is possible that the respondent is the secondary or tertiary earner of the family, in which case large household size may indicate availability of an alternative income source -- the factor sought in the choice of Income of Others in Household. If these explanations hold, a positive and statistically significant coefficient for Household Size makes sense.

Regarding Income of Others in Household, since the respondent is not necessarily head of the household, the effect of being a secondary or tertiary earner of the family may be picked up by this variable. Since, as stated above, financial pressure on the secondary or tertiary earners would normally be less than on the primary earner, chances are that they have a less intense drive to seek high-paying jobs. In addition, secondary workers are likely to be younger and less-experienced than primary earners. These factors may have contributed to the negative correlation between Hourly Wage and Income of Others in Household.

Regarding the variable Not Receiving Welfare, the positive coefficients may be explained by the clustering of workers with high wage jobs among non-recipients of welfare because of the likelihood of high wage individuals being ineligible for public assistance.

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(2) Weeks Worked

The Weeks Worked regression shows that in either the ES/UI or the JTPA population, none of the occupational groups is significantly different from the Laborer group -- when all the explanatory variables postulated in the conceptual model are included in the regression. (See Table 1-9b.) However, as Tables 1-13 and 1-14 show, all occupational categories except Clerical and Sales become significantly different from Laborer when the analysis is limited to the three human capital indicators (i.e., skill, high school diploma, and experience), gender, and ethnic characteristics. As in the case of the hourly-wage analysis, what is more important here are the changes in the size of the regression coefficients for the Technical and Administrative and the Clerical and Sales categories, as well as High School Diploma, when the literacy variable (prose-comprehension score) is included in the regression. While the ES/UI regression indicates that in terms of the number of weeks of employment there are about 21 and 17 percent advantages to the Technical and Administrative and the Clerical and Sales groups over Laborer when the effects of literacy are not explicitly accounted for, such advantages are reduced to 13 and 12 percent respectively when the literacy variable is entered. This indicates the presence of a large element of general workplace proficiency as an integral component of any occupational skill picked up by literacy scores. Similarly, the coefficient for High School Diploma is halved when the literacy variable is included. As in the case of the analysis of hourly wages, this is likely to be a reflection of the separation of substantive proficiency and "credentialling effect" components in the role of High School Diploma.

Table 1-9b indicates that neither gender nor ethnic characteristic is significant in the full regression model, except for the JTPA population, in which male workers are estimated to have worked 16-percent more weeks than females. Again of greater interest are the changes in the regression coefficients in this case (as presented in Table 9) for White (from a 17 to 5 percent advantage over Black) and Male (from a 3 to 4 percent disadvantage against Female) when the effect of literacy is explicitly evaluated. In case of the white-black comparison, this result indicates a substantial literacy component in the white advantage in the labor market; and, in case of the male-female comparison, the result shows the prevalence of male workers' advantage over female workers in the labor market despite their disadvantage in literacy.

Personal and family characteristics apparently have a significant impact on the labor market behavior and success of workers in both populations. As Table 1-9b shows, in both populations Being Married and Not Receiving Welfare are highly significantly related to number of weeks worked, and Income of Others in Household tends to be negatively correlated with weeks worked. This is quite consistent with what we would expect of the impact of family responsibility and alternative income sources on labor force participation of workers.

Table 1-13: Estimated Percentage Change in Weeks Worked, with One-Unit Change in the Selected Explanatory Variable -- ES/UI Population

	Holding Literacy Fixed		Excluding Literacy	
Explanatory Variable	Change in Weeks Worked (%)	t-score	Change in Weeks Worked (%)	t-score
Prose Comprehension Score	.273	5.947	-	-
Male	-3.719	-.968	-2.844	-1.109
Prose Comprehension Score	.124	4.259	-	-
Male	13.325	4.913	7.19	2.36
White	4.806	.815	16.967	3.049
Hispanic	4.341	.673	2.469	.381
Other	-9.505	-1.026	-9.121	-.979
Technical & Administrative	13.236	1.831	21.082	2.950
Clerical and Sales	12.842	1.803	17.241	2.420
Operative and Craft	24.031	3.598	23.870	3.554
Service	8.133	1.028	7.774	.977
High School Diploma	9.706	2.122	18.511	4.254
Years of Work Experience	.025	.052	.273	.568
Years of Work Squared	-.013	-1.229	-.020	-1.887

Table 1-14: Estimated Percentage Change in Weeks Worked, with One-Unit Change in the Selected Explanatory Variable -- JTPA Population

Explanatory Variable	Holding Literacy Fixed Change in Weeks Worked (%)	t-score	Excluding Literacy Change in Weeks Worked (%)	t-score
Prose Comprehension Score	.471	6.448	-	-
Male	35.094	5.153	23.386	4.176
White	24.966	3.018	38.448	4.758
Hispanic	21.819	1.549	18.881	1.328
Other	29.475	1.654	40.337	2.254
Technical & Administrative	6.566	.506	19.556	1.542
Clerical and Sales	7.652	.658	15.373	1.316
Operative and Craft	16.268	1.589	17.709	1.714
Service	-1.764	-.157	-3.179	-.281
High School Diploma	19.589	2.898	35.084	5.500
Years of Work Experience	-2.309	-2.773	-1.633	-1.958
Years of Work Squared	.039	1.862	.020	.976

(3) Hours Worked

There is little inherent reason to expect the three human capital indicators (occupation, high school diploma, and work experience) to be related to intensity or regularity of work which Hours Worked seems to represent. Indeed, as Table 1-9d shows, this expectation is borne out in the regression results. Only the Service occupation is associated with fewer hours of work per week than the Laborer group. This is perhaps due to the greater instability that characterizes the jobs in this occupational group.

Gender and ethnic characteristic seem to be important determinants of hours worked for the JTPA population, in which males worked 36 percent more hours than females and whites worked 21 percent more hours than blacks. (See Table 1-9d.) A large gap occurs in the coefficient for White between the analyses including and excluding the literacy variable as an explanatory variable of hours worked. (See Tables 1-15 and 1-16.) According to Table 1-16 estimates, whereas whites are shown to have worked 40-percent more hours per week than blacks when literacy is not explicitly accounted for, this white-black difference falls to 27 percent once the literacy variable is entered in the regression.[40] This suggests that the steadiness of employment among white workers as compared with black workers is, again, due largely to the literacy gap between the two ethnic groups.

The outcomes regarding marital status and other family characteristics are similar to those for weeks worked. Table 1-9d shows that both Income of Others in Household and Not Receiving Welfare are highly significantly related to Hours Worked.

(c) A Graphic Illustration of the Effects of Literacy

We can graphically show, respectively for ES/UI and JTPA, the relationship between hourly wages and the number of years of work experience for two different types of individuals -- high school graduates in operative and craft occupations and those not having a high school diploma and in the laborer occupation. Let us call such relationship a wage function. The wage functions graphed here were constructed using the regression results in Table 1-9. A wage function graphed in such a manner is sometimes referred to as a wage profile. Using the estimated regression coefficients for each population, six wage functions were derived corresponding to prose-comprehension proficiency scores of 200, 225, 275, 325, 375, and 500. These wage functions are specific to, in addition to those identified above, individuals with the following characteristics: Male, White, Being Married, Household Size = 2, Income of Others in Household = $25,001-$35,000, Not Receiving Welfare, and located in a state where Statewide Average Pay = $22,567 and Unemployment Rate = 7 percent. (Of course, the wage functions for other individuals with different characteristics and for document and quantitative literacy can be easily derived.)

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[40] The difference in coefficients for Male between Table 1-9 and Table 1-16 is due to the different sets of variables included in the regression.

Table 1-15: Estimated Percentage Change in Hours Worked, with One-Unit Change in the Selected Explanatory Variable -- ES/UI Population

	Holding Literacy Fixed		Excluding Literacy	
Explanatory Variable	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Prose Comprehension Score	.167	3.815	-	-
Male	2.434	.667	2.025	.554
White	8.085	1.453	15.254	2.906
Hispanic	-3.508	-.571	-4.967	-.809
Other	-10.182	1.104	-10.676	-1.155
Technical & Administrative	-1.580	-.230	3.396	.501
Clerical and Sales	-6.982	-1.035	-4.089	-.609
Operative and Craft	15.706	2.488	15.655	2.474
Service	-8.624	-1.158	-8.553	-1.146
High School Diploma	6.208	1.437	11.443	2.786
Years of Work Experience	.308	.669	.465	1.012
Years of Work Squared	-.023	-2.176	-.028	-2.641

Table 1-16: Estimated Percentage Change in Hours Worked, with One-Unit Change in the Selected Explanatory Variable -- JTPA Population

Explanatory Variable	Holding Literacy Fixed		Excluding Literacy	
	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Prose Comprehension Score	.480	6.215	-	-
Male	41.465	5.859	34.733	4.920
White	27.062	3.125	40.318	4.759
Hispanic	36.542	2.513	32.828	2.238
Other	25.096	1.328	36.504	1.931
Technical & Administrative	-16.445	-1.217	-2.248	-1.167
Clerical and Sales	-8.457	-.701	-.335	-.028
Operative and Craft	18.378	1.735	20.203	1.891
Service	-30.654	-2.627	-31.533	-2.677
High School Diploma	8.657	1.225	24.264	3.640
Years of Work Experience	-2.792	-3.228	-2.131	-2.459
Years of Work Squared	.046	2.125	.028	1.306

The wage functions for the proficiency scores 500, 375, 325, 275, and 225 correspond to the upper limits of the five literacy levels that have been identified by Educational Testing Service as meaningful benchmarks. For example, Levels 1 and 2, with corresponding upper-limit scores of 225 and 275, are considered by ETS as very "limiting" in terms of the individual's ability to perform in the workplace. While these functions are constructed using estimated parameters based on cross-sectional data, a wage profile is an estimated portrayal of what happens to the hourly wage one earns over time, and the six functions in each graph represent different wage-growth paths associated with varying literacy levels.[41] (See Figures 1-1 through 1-4.)

The difference literacy makes in one's career growth is clearly shown by these wage functions. For example, among JTPA applicants with a high school diploma and in the operative and craft occupation (Fig. 1-1), those with a proficiency score of 225 are associated with the entry wage (i.e., year=1 on the horizontal axis) of about $5.40 and reach the peak career wage of only about $6.70 at around the 30th year. In comparison, an individual with a proficiency score of 375 would start with an hourly wage of over $6.50 and reach a career peak of over $8. Among ES/UI jobseekers of the same schooling level and in the same occupational group (Fig. 1-2), an individual with a proficiency score of 225 would start with about $8.65 and peak at about $11.40, while someone with a proficiency score of 375 would start at around $10 and peak at over $13.

As one would expect, the wage functions of those without a high school diploma and in the laborer occupation are positioned considerably lower than the corresponding wage functions for those with a high school diploma and in operative and craft occupations. JTPA applicants (Fig. 1-3) with a prose proficiency score of 225 start at about $4.75 and peak at about $5.90, and applicants with a score of 375 start at almost $5.75 and peak at over $7.10. ES/UI jobseekers (Fig.1-4) with a proficiency score of 225 start at almost $7.75 and peak at almost $10.20, and jobseekers with a score of 375 start at almost $9

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[41] In reality, it is likely that gaps among these wage functions widen over time to an extent greater than these graphs indicate. This is because, with the increasing sophistication of literacy skills required in the workplace, workers at low proficiency levels would suffer an increased disadvantage, as time progresses, relative to those at high proficiency levels. This aspect of the effects of literacy on wages is not incorporated in these graphs, since they are constructed using the regression results which are in Table 1-9 and in which the functional relationship between wages and years of experience is assumed to be the same regardless of the level of literacy. Actually, we did experiment with a regression model that included an interaction term between the literacy score and years of work experience. We attempted to estimate the coefficient for this interaction term for JTPA and ES/UI separately with respect to each of the three literacy scales. In all cases except one, the coefficients for this variable were of the right sign (i.e., positive), a finding which is consistent with the notion of widening gaps among the wage profile with increasing years of work experience. However, none of these coefficients was statistically significant, and we decided not to present the results in the text. Nevertheless, these results are graphed and presented in Appendix Figures A-1-1(a) through A-1-1(f) as an illustration of the wage profile with a widening gap over time.

Figure 1-1: **Wage Profiles (JTPA)**
– Operative and Craft, High School Graduate
(Prose Comprehension)

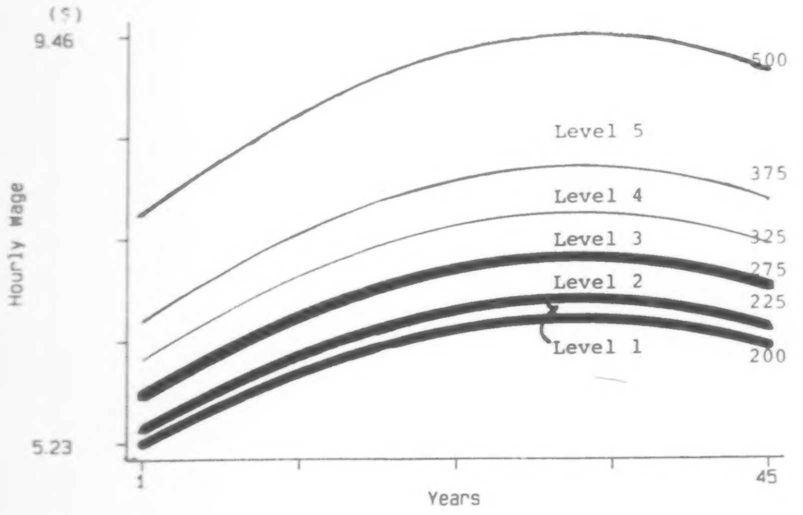


Figure 1-2: **Wage Profiles (ES/UI)**
– Operative and Craft, High School Graduate
(Prose Comprehension)

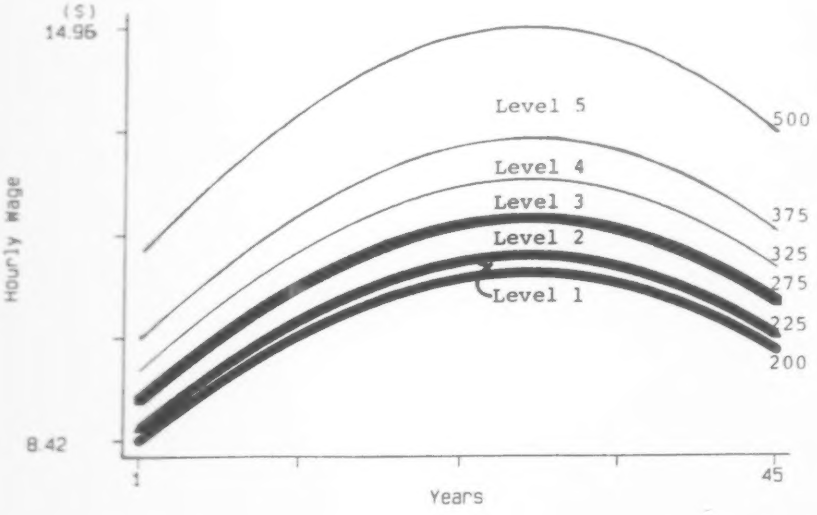


Figure 1-3: Wage Profiles (JTPA)
– Laborer, No High School Diploma
(Prose Comprehension)

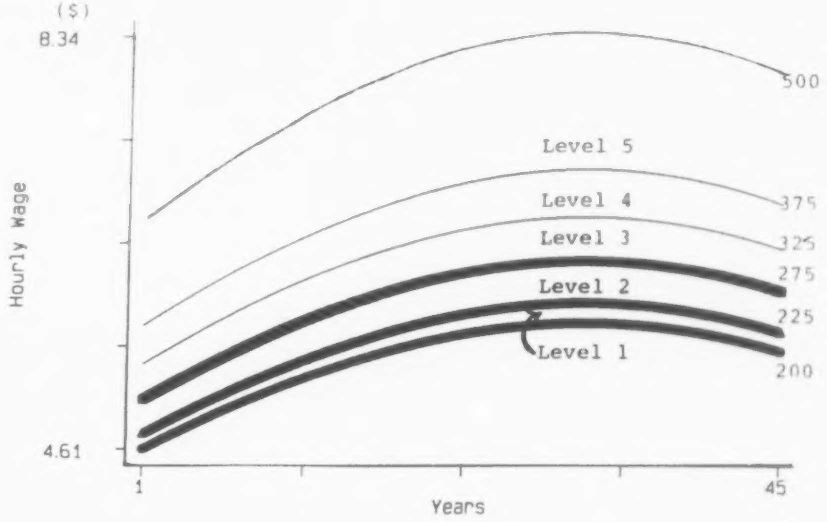
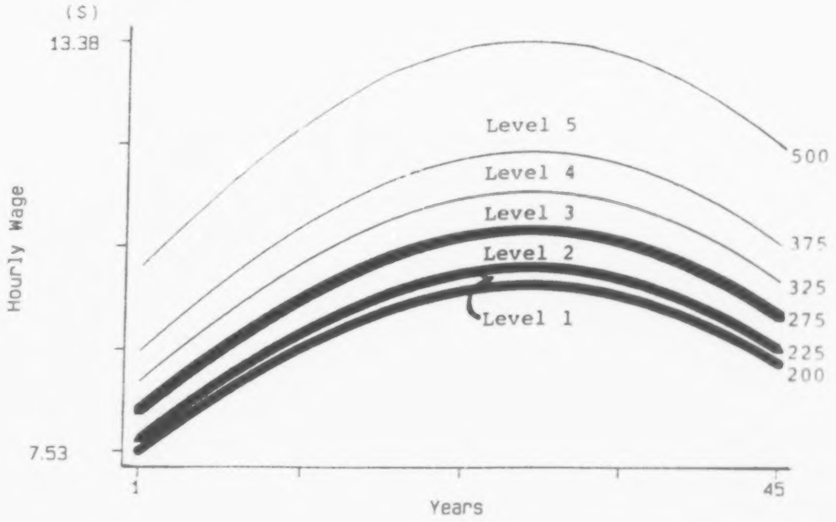


Figure 1-4: Wage Profiles (ES/UI)
– Laborer, No High School Diploma
(Prose Comprehension)



and peak at over $11.82. These graphs demonstrate visually the difference literacy makes not only regarding the wages one earns at a given point in time but also regarding the totality of a worker's lifetime earnings.

C. CHAPTER SUMMARY AND POLICY IMPLICATIONS.

This chapter has shown that literacy is an essential factor in the labor market success of jobseekers in the Employment Service and Unemployment Insurance systems and of participants in JTPA training programs. Literacy, analyzed in this chapter as a determinant of earnings, wages, and employment, is defined by the test instrument developed by Educational Testing Service as ability in reasoning, comprehension and use of information. This is a departure from conventional thinking about literacy in the sense of the three Rs, in which the traditional academic skills of reading, writing, and mathematics are viewed in isolation from their actual use, and even from the functional competency where narrowly -defined skills of a specialized nature are tested. Because this kind of literacy emphasizes synthesizing knowledge gained in various facets of learning, it reflects closely the kind of proficiency required in the actual workplace -- especially in the future, when, more and more, the ability to grasp and process information will be demanded.

We have analyzed in this chapter how this type of literacy, referred to as workplace literacy, is related to the labor market success of unemployed workers in two Department of Labor client populations -- namely, Job Training Partnership Act participants and jobseekers in the ES/UI systems.

In examining the role of literacy, this chapter has evaluated the effects of literacy independent of other strategic variables, such as occupation, high school diploma, work experience, and personal and family characteristics. Many of these variables are inherently relevant to how workers perform in the labor market but, more interestingly, much of the variables' contributions to the earning power and employability of workers can be traced to the workplace literacy that lies beneath each of the variables. To separate the literacy component from the effect of each strategic variable is useful from the policy -making standpoint because, frequently, literacy is a more readily identifiable measure than the variable that subsumes it. A good example is the white-black gap in wages, which could be narrowed considerably if the literacy gap is narrowed. Knowing how literacy relates to this wage gap would help us grasp the relevance of literacy programs in combatting differences in economic well-being among ethnic groups.

The main findings in this chapter pertain to:

1. Literacy Scores and Worker Achievement

In both populations, the literacy score is a powerful predictor of worker achievement in the labor market. For example, for the ES/UI population, a 50-point difference in prose-comprehension score makes as much as a 34-percent difference in annual earnings; and, for the JTPA population, the same amount of difference in prose-comprehension score makes over a 63-percent difference in annual earnings. A 50-point difference signifies a shift from the mid-point of ETS' Level 2 of literacy proficiency, which is insufficient for full performance in the workplace, to the mid-point of Level 3, a level just adequate in the workplace.

2. Literacy and the Hourly Wage

When annual earnings are decomposed into three components -- hourly wage, weeks worked, and hours worked -- it is evident that among ES/UI jobseekers, literacy works primarily through the hourly wage to affect workers' economic well-being. A one-point increase in proficiency score for prose comprehension or document or quantitative literacy is associated with about a .1-percent increase in hourly wage. In comparison, among JTPA trainees literacy operates through each of the three components of earnings. The effect on hourly wage of a one-point increase in the scores in prose or document proficiency is about a .1-percent increase -- similar to what happens for the ES/UI population. Among JTPA trainees, a one-point increase in proficiency score in any of the three literacy areas is associated with a nearly .3-percent increase in weeks worked and a nearly .4-percent increase in hours worked.

3. Differences Between ES/UI and JTPA

There is a striking difference between the ES/UI and JTPA populations in the way literacy affects worker achievements in the labor market. First, for the JTPA population, weeks worked, hours worked, and hourly wage are relevant avenues through which literacy operates to help improve a worker's labor market performance, while for the ES/UI population, the major impact of literacy is on the hourly wage.

Second, a drastic difference between the two populations in the effects on weeks worked and hours worked points to a substantive advantage in employability produced by literacy among JTPA trainees. The labor market achievement of workers in the JTPA population is far more responsive to literacy proficiency than in the ES/UI population because of the difference in the effect on weeks worked and hours worked. Thus, overall, JTPA participants are expected to be much more responsive to literacy training than ES/UI jobseekers.

The similarity between the two populations in the magnitude of impact on the hourly wage suggests that the effects of literacy on productivity (to the extent that these effects are measured by wage rates) is fairly stable.

4. Literacy and Past Employment

In both populations, the achievement in the labor market of those with little past employment is far more responsive to improved literacy.

5. The Effects of Occupational Skills

The advantage associated with occupational skills is reduced substantially when literacy is explicitly introduced into the analysis. This indicates that much of the advantageous effect of occupational skills on wages and employment is due to proficiency in a broad sense as against narrowly-defined firm- and job-specific skills.

6. The "Credentialling" Effect

The substantial residual effect of having a high school diploma, after the effects of literacy are accounted for, indicates that the "credentialling" effect is quite prevalent in the labor market and workplace, thus giving credence to the importance for many young people of the high school diploma itself, in addition to the acquisition of substantive knowledge and skills in school.

The implications of the findings in this chapter are fairly obvious. First, for participants in both Department of Labor client populations studied, solid training in literacy of the type characterized by the ETS assessment would go a long way toward improving workers' wages and employability. This is especially true with respect to JTPA trainees and to the long-term unemployed among ES/UI jobseekers. Since this type of literacy skill is "portable," and since its benefits accrue to society as a whole and not to individual firms or industries, such human capital should be considered as a social overhead. This is a powerful argument for publicly-funded job training with a significant literacy component. Secondly, much of the skill content of occupations is general literacy, which complements proficiency in specific skills; thus, an emphasis on literacy training is crucial in maintaining a high level of productivity. Thirdly, in today's labor market, where the process "signalling" a worker's substantive capability is imperfect, a large part of a hiring decision hinges on whether a job applicant has completed school. So, the message to young people in school is quite clear: By all means, graduate and get that diploma!

CHAPTER II

WHAT DETERMINES THE LITERACY LEVELS OF UNEMPLOYED WORKERS?

In the preceding chapter, we examined the relationship between literacy and various measures of economic achievement of unemployed workers. In that analysis, we defined workplace literacy as a comprehensive ability to synthesize and reason. For the present survey, it was measured in three ways by ETS proficiency scores -- prose comprehension, document literacy, and quantitative literacy. The analysis has clearly shown that labor market achievement for JTPA and ES/UI participants is a function of literacy. Logical follow-up questions are: "What determines the workplace literacy of an individual?" and "What measures can be taken to improve literacy so that a worker can better perform in the workplace and, more importantly, meet the future demands of the labor market?" This chapter seeks answers to these questions.

Throughout the chapter, we will argue that workplace literacy, essential in achieving success in the labor market, encompasses analytical and independent thinking ability going beyond the traditional three R's. We argue further that the holistic experience of schooling, home environment, literacy-related life-styles, and workplace experience is crucial in the development of this ability.

The analysis of this chapter is intended ultimately to answer four fundamental questions: What effect do past training and education have on literacy? What impact does one's growing-up environment have on literacy? How does the use of literacy skills either on the job or at home affect workers' literacy? How is workers' awareness of the level of their literacy ability reflected in their workplace literacy levels?

Our answers will be valuable in formulation of training and education programs. Section A identifies and discusses various potential determinants of literacy with a discussion of how each may affect individual literacy levels. Section B presents a narrative discussion of the literacy levels of various sub-groups. In Section C, we test statistically the a priori notions of the factors identified in Section A, and we estimate their relative importance. Section D summarizes the statistical findings and draws a few policy implications.

A. WHAT DETERMINES LITERACY?

A worker's literacy may be viewed as manifesting the consumption demand of the individual's self and family. As such, it is a product of family and personal characteristics representing "taste" and the cost ("price") of acquiring literacy and financial resources. For example, parents' ambitions with respect to their children's fulfillment of life and their financial ability play a crucial role in determining the demand for their children's education and other literacy-enhancing activities.

At the same time, literacy proficiency may be considered as the embodiment of one's past decision to forgo current consumption in favor of future returns. In this sense, the literacy level of an individual reflects the person's assessment, at some time past, of the return on her or his investment in acquiring literacy. Such investment would include not only the direct cost of education and training but earnings forgone while receiving education and training to enhance literacy proficiency.

The forces generated from these two directions culminate in motivation to learn, consciousness of one's level of literacy, acts of learning, and continued sharpening of literacy skills throughout as determinants of workplace literacy.

Some of the variables representing these explanatory factors of an individual's literacy level are exogenous to the pursuit of literacy; others are endogenous in the sense that not only do they affect one's literacy proficiency but also receive a feedback from literacy. Among the first group of variables are family background, especially with respect to parents' educational achievement and cultural and ethnic traits; individual's educational level; literacy-related family activities in childhood and youth; and past experience that may have an impact on literacy -- such as military service, disability status, and community interest in literacy or a broader domain of education. The second type of variables include: current lifestyle, job requirements, self-assessment regarding one's literacy level, and the need for improvement and motivation, all of which are likely to affect one's proficiency and, in turn, to be influenced by the attained level of literacy.

1. Family Background and Early Literacy Practices

Family background is relevant to the formation of individual literacy on three counts. First, parents' educational status and intellectual awareness, as well as their own aspirations and abilities to provide support, have much to do with early childhood activities and upbringing, occurring hand in hand with conscious parental decisions on their children's intellectual well-being. This is an inter-generational investment governed by parental demand for children's literacy attained through formal schooling and other educational activities.

The activities of a family when a child is growing up leave a lasting impact. Therefore, perhaps more than formal schooling, the pre-school environment offered by the family to stimulate the child's intellectual capability is crucial in life's formative stages and paves the way for further development. For this reason, family practices, such as having reading materials around the home, reading regularly to children, encouraging children to have an inquisitive mind, engaging in educational activities, ensuring access to computers, and even promoting stimulating dinnertime conversation, contribute to the early formation of literacy proficiency -- especially when literacy includes, as it should in the context of workplace literacy, the ability to pull together information and to think independently. Thus, to the extent that a child's early development prepares him or her for the smooth absorption of intellectual materials in later stages of life, this kind of pre-school investment complements later investments in schooling. However, inasmuch as the demand for these family literacy activities and backgrounds is a function of the family's financial capability, the predominance of this factor in explaining variations in literacy would imply, from the social standpoint, the need for equalization of home backgrounds in order to enhance literacy levels -- and hence, ultimately, the economic well-being -- of disadvantaged workers and their children. In other words, emphasizing literacy through schooling alone, without equalizing family environments, may very well exacerbate polarization of literacy levels.

Second, workplace literacy involves not only proficiency in traditional reading, writing, and mathematics but, more importantly, in using analytical ability in the workplace. It is clear, then, that knowledge of and familiarity with the languages and culture of actual workplaces are essential in attaining proficiency in workplace literacy. Since communications, customs, and practices in these environments are often geared to the traditional mainstream American workforce -- a group that is predominantly male, white, and English-speaking -- individuals who are culturally and ethnically outside of the predominant culture are at a disadvantage. This kind of problem frequently handicaps the workplace performance of women, minority members, and immigrants.

These groups experience such disadvantages, but assessment testing itself may be influenced by this kind of cultural difference. This is because the language of the workplace is often attuned to the language of the cultural majority of the population, and the test of workplace literacy itself is bound to be worded in terms of such language. To the extent that this is true, minority groups in the population, ethnic and otherwise -- with cultural backgrounds different from the culture of the workplace majority -- would be disadvantaged in achieving literacy test scores comparable to those of the majority. Thus, it is important to emphasize that tests such as the ETS assessment instrument, in which the languages and customs of the actual workplace are an integral part of the assessment task, are influenced by race, ethnic grouping, and gender, and are likely to be important in explaining the measured literacy level of the worker.

Further, in this dynamic economy the language and culture of the workplace are subject to evolutionary changes, so that one's literacy proficiency is likely to deteriorate over time unless conscious efforts are made to keep up. Since the expected payoff to the investment of time and resources required to keep up with these changes tends to diminish as workers grow older, the incentive to make such investment declines. Hence, there may very well be an inverse relationship between age and literacy in the upper age range. Conversely, at the lower end of the age scale, literacy and age should be positively correlated because of the high payoff-to-investment ratio in learning.

2. Schooling and Related Experiences

It is almost superfluous to say that schooling exerts an impact on workplace literacy since, after all, imparting "literacy" and "numeracy" on students is the raison d'etre of formal education -- at least, at the primary and secondary levels. To the extent that the three R's, the mainstay of academic training at these levels, are the precondition for the power of analytic thinking, schooling is expected to be a major determinant of workplace literacy. In the analysis of the impact of schooling, two points need to be made here. First, quality of education varies greatly among school districts, States, and regions, being largely a function of a community's interest and willingness to invest. So, in order to evaluate the effect of schooling on the workplace literacy of individuals, the variation among locales in this regard, as represented by such measures as per-pupil education expenditure, needs to be taken into account. Secondly, schooling can be attained outside of the formal educational system through self-teaching and private tutoring, with the same improvement in one's three R's as going to school. Thus, the variations in literacy due to such out-of-class learning need to be taken into consideration in order to bring a sharp focus on the effects of schooling in literacy evaluation. In analysis of schooling, for example, whether an individual has attained a GED certificate needs to be included for this purpose -- and attainment of a GED may signify added qualities such as drive and motivation, which are also likely to affect one's workplace literacy.

Finally, military service is, in many instances, akin to receiving additional schooling and training, while at the same time instilling in soldiers the discipline and sense of responsibility which are indispensable in learning. For this reason, one would expect that military experience often has both direct and indirect positive impacts on workers' literacy.

3. Disability

Learning disability and any physical, mental, or other health disability are often an obstacle to one's learning; and, the effects of these factors need to be taken into account before the impact of other relevant factors are to be evaluated.

4. Literacy-Related Lifestyle

It is reasonable to assume that home activities that involve reading, writing, and calculation stimulate thinking ability and, therefore, have a positive influence on one's workplace-literacy level. Such activities can range from regular reading of newspapers and periodicals to playing board games and even computer games. The extent and type of reading and writing have varying stimulating effects on one's literacy proficiency. At the same time, one's level of literacy itself determines what and how often one reads and writes. Perhaps the two most prevalent daily activities related to literacy are newspaper reading and television. These two types of activities can have an important place in the determination of one's literacy level because of their regularity and the large amount of time spent on them by most people. Reading newspapers obviously can have a profound impact on people's proficiency in various facets of literacy. It is not only the reading and understanding of political, economic, social, and financial pages that is beneficial in improving literacy proficiency, but the "soft" sections -- such as sports and social pages -- can be helpful in improving one's workplace literacy. For example, implicit in the understanding of batting averages in baseball is the idea of the arithmetic mean, which can be transported to the workplace environment. Many people enjoy doing crossword puzzles, which clearly can help build vocabulary with ultimate benefit to their communications abilities.

Similarly, the extent of television watching is mutually interdependent of one's already-attained level of literacy. The effect TV watching may have on one's literacy proficiency depends not only on the number of hours watched but also on the quality of programs selected, which in turn is a function of literacy level itself. This latter factor is highly relevant in assessing the effect of TV watching, since the types and quality of programs offered on TV are extremely diverse -- some programs are informative, thought provoking, and challenging while others are only superficial entertainment with little substance. It has been argued that TV watching can be not only wasteful but a detriment to intellectual growth, since some types of programs cater to the unprobing and uninquisitive mind and thereby discourage intellectual discipline. From the prevalence of these kinds of programs in high Nielsen ratings, apparently a great number of people watch them. To the extent that this is true, concern about TV's detrimental effects is real. As to the relationship between the amount of time spent on TV watching and the proficiency score, therefore, a mixed result would be expected unless the types of programs watched are identified.

5. Job Requirements

A close correspondence between job requirements and type and qualification of worker is expected since, in a normal employee-selection process, the employer tries to fill a vacancy with the best-qualified applicant. So, if the job involves tasks reading documents, writing memos, and filling out forms, we would expect to find a worker adept at these tasks. Concomitantly, if performance of these tasks requires proficiency in any or all of the three workplace-literacy areas, the proficiency of an individual is expected to be closely related with what he or she does on the job. Similarly, if a worker considers reading, writing or mathematics important in performing a job, it is likely to be so because he or she was hired to perform the jobs on the basis of proficiency in these areas.

Another way of looking at the relationship between job requirements and worker proficiency in any of the three areas of workplace literacy is to view each job partly as a learning process by which the worker accumulates knowledge and skills in order to improve productivity. In this human capital theoretic view, then, it is reasonable to grasp job requirements – whether reading, writing, mathematics or any other skill – as stimulating workers' literacy growth. Similarly, the worker awareness of the importance of these tasks would indicate the presence of this kind of literacy-stimulating effect of job requirements. This effect of on-the-job improvement is particularly relevant when our concern is for workplace literacy.

6. Self-assessment

The self-appraisal of one's literacy proficiency prompts a motivation for improvement. Whether or not the worker considers her or his level of literacy sufficient for current job tasks vis-à-vis aspirations for the future can determine the motivation for improvement. In this sense, a worker's awareness of the insufficiency of a specific skill or of the need to improve in order to better his or her economic lot can generate a driving force for literacy attainment.

B. NARRATIVE ANALYSIS OF THE DETERMINANTS OF LITERACY

Literacy, as measured in terms of the three types of proficiency scores -- prose comprehension, document literacy, and quantitative literacy -- will be analyzed statistically against the variables identified in the preceding section. Not all the variables intuitively considered as determinants of literacy lend themselves readily to quantitative measurement, and some even stand only for broad areas which need to be made specific and concrete for analytical purposes. Table 2-1 presents selected measured variables vis-à-vis the previously-identified conceptual variables and their measures. Let us examine below how each of these measured variables is related to the proficiency scores in the two populations in our study. This will give us some preliminary idea as to the relevance of these selected variables in explaining workplace literacy and will serve as a point of departure for a more precise evaluation, through a multivariate analysis, of the variables' net effects and of their relationships to workplace literacy.

Table 2-1: Explanatory Variables of Literacy

Conceptual Variable	Measured Variable	Measurement
A. Family Background		
Parent's Schooling	Mother's Schooling	0-8 years; 9-12 years (no H.S. diploma); high school diploma; post high school voc./trade ed.; college 2 years or less; college more than 2 years
Language	Language Spoken Growing up	Spoke English=1; Did Not Speak English=0
Household Income	Household Income	Less Than $5,000; $ 5,000- 9,999; $10,000-14,999; $15,000-19,999; $20,000-29,999; $30,000-39,999; $40,000-49,999; $50,000 and over
Ethnic Group	Ethnic Group	White, Black, Hispanic, Other
Gender	Male-Female	Female=0; Male=1
B. Schooling		
Schooling	Schooling	0-8 years; 9-12 years (no H.S. diploma); high school diploma; post high school voc./trade ed.; college 2 years or less; college more than 2 years
School Dropout	Dropout	High School Dropout (without GED)=0; H.S. Diploma or GED=1
C. Family Practice in Youth		
Availability of Reading Material	Newspaper; Magazines; Over 25 books, Encyclopedia, or Dictionary in home while in school	No=0; Yes=1
D. Disability	Currently have Learning Disability	No=0; Yes=1

(**Table 2.1** continued)

E. Current Lifestyle		
Frequency of Reading Newspaper in English	Frequency	Every day; Few times a week; Once a week; Less than once a week; Never
TV Watching	Hours of TV Watching	None; Up to 1 hour; 1 up to 2 hours; 2 up to 3 hours; 3 up to 4 hours; 4 up to 5 hours; 6 hours or more
F. Job Requirement	Using Reports, Forms, Letters and Diagrams on Job	No=0; Yes=1
	Filling (Writing) Forms, Memos, Reports, and Bills	No=0; Yes=1
	Importance of Reading on Job	Not important, Important, Very important
	Importance of Writing on Job	Not important, Important, Very important
	Importance of Mathematics on Job	Not important, Important, Very important
	Importance of Talking on Job	Not important, Important, Very important
	Importance of Listening on Job	Not important, Important, Very important
G. Self-assessment		
Thinks Skills Good Enough for Job in:	Reading Writing Mathematics	No=0; Yes=1 No=0; Yes=1 No=0; Yes=1
Anticipates Better Job with Improvement in:	English Math	No=0; Yes=1 No=0; Yes=1

1. Family and Personal Characteristics

Family and personal background are represented by five variables: mother's schooling, language spoken when individuals were growing up, gender, ethnic classification, and household income. Parents' schooling data were obtained from the response to the question: "What was the highest grade your mother (step-mother or female guardian) completed in school?" The responses were in 10 categories, which were collapsed into six categories for present analysis. Mother's schooling is chosen to stand for parents' schooling, since there is a high correlation between mother's schooling and father's schooling and, moreover, there are in our data a larger number of missing values with respect to father's schooling than to mother's schooling. The use of both mother's and father's schooling data in the analysis would reduce the number of observations, thus reducing the reliability of the estimated parameters without meaningful gains in analysis. More importantly, a cursory analysis indicates that individuals who did not provide father's schooling have characteristics correlated with literacy. Thus, inclusion of the father's schooling data in the analysis, with the consequent loss of the observations for which this statistic is not missing, is likely to result in bias in the analysis. For this reason, the use of the mother's schooling statistic alone is not only sufficient to represent parents' schooling but also preferable.[42]

Tables 2-2a, b and c suggest a high correlation between mother's schooling and literacy. Several observations can be made from these tables: first, respondents with very low literacy proficiency tend to come from families with parents of limited education. Specifically, respondents from either JTPA or ES/UI populations who have literacy considered inadequate to perform in the workplace (i.e., scores at or below 275) generally are associated with mothers with only eight years or less of schooling. Moreover, it is noticeable that mean proficiency scores of those with mothers who had attained a high school diploma or more are dramatically higher than other scores. This suggests that some quality other than merely academic achievement (be it the drive to succeed, tenacity, or discipline) underlies high school completion, is being transferred intergenerationally, and manifests itself in the literacy proficiency of offspring.

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[42] Among JTPA respondents, 2,156 gave mother's schooling while only 1,949 gave father's schooling. The corresponding figures among the ES/UI respondents are 3,010 and 2,855 respectively. A simple chi-square analysis shows that mother's schooling and father's schooling move hand-in-hand. In addition, literacy-proficiency scores of respondents who did not report father's schooling (i.e., are missing observations as regards the father's schooling statistic) tend to cluster at a level far lower than those of the respondents who reported father's schooling. For example, mean prose-comprehension scores for these two groups of respondents are 264 and 294. Regarding the issue of potential bias, we find that there also is a substantial number of missing observations with respect to mother's schooling and that the literacy levels of respondents with missing values are lower than that of others. So, use of the mother's schooling data also has an inherent bias problem; and we need to be cautious in interpreting the results in any case.

Table 2-2a: Mean Literacy-Proficiency Scores -- Family Background

	Population Mix		Proficiency Score					
			Prose		Document		Quant.	
Variable	JTPA (%)	ES/UI (%)	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
Mother's Schooling:								
0-8 years	22.2	23.2	279	264	268	257	275	268
9 up to 12 years	27.1	17.8	283	288	272	282	278	287
High School Grad.	36.9	38.2	292	300	282	293	289	297
Post High School Voc./Trade Ed.	2.6	2.4	307	312	293	306	292	312
Some College	2.8	3.7	301	302	290	294	295	316
College Graduate	8.4	14.6	300	321	289	311	297	317
	100.0	100.0						
(Non-respondents)	-	-	259	261	254	260	258	267
Language Spoken Growing up:								
English			286	297	275	290	282	296
Non-English			247	246	247	238	245	254
Household Income:	(%)	(%)						
Less Than $5,000	28.6	8.8	271	263	261	257	263	266
$ 5,000- 9,999	25.3	12.1	286	268	280	261	285	271
$10,000-14,999	14.2	13.9	282	282	273	268	282	278
$15,000-19,999	8.6	11.3	297	286	292	277	292	287
$20,000-29,999	11.1	17.7	296	293	290	290	297	296
$30,000-39,999	7.3	14.3	314	309	294	302	309	304
$40,000-49,999	2.9	8.7	307	305	295	297	303	304
$50,000 or Over	2.0	13.3	316	324	287	320	305	325
	100.0	100.0						

Table 2-2b: **Mean Literacy-Proficiency Scores -- Income Per Household Member**

	Proficiency Score					
	Prose		Document		Quant.	
	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
Less Than $1,000	270	252	258	246	259	252
$ 1,000- 2,499	281	262	273	253	278	262
$ 2,500- 4,999	289	272	283	268	287	277
$ 5,000- 7,499	293	295	285	285	295	290
$ 7,500- 9,999	293	293	293	285	296	296
$10,000-14,999	296	307	283	298	298	307
(No Response)	286	301	272	294	282	300

Table 2.2c: **Mean Literacy-Proficiency Scores -- Income Per Household Member (16-20 and 16-25 Years Old), JTPA and ES/UI Combined**

	Proficiency Score					
	Prose		Document		Quant.	
	16-20	16-25	16-20	16-25	16-20	16-25
Less Than $1,000	248	251	246	246	250	250
$ 1,000- 2,499	270	263	260	260	261	264
$ 2,500- 4,999	272	268	263	264	263	272
$ 5,000- 7,499	271	288	272	286	273	283
$ 7,500- 9,999	291	297	308	291	311	305
$10,000-14,999	287	285	289	287	300	289
(No Response)	282	284	284	282	277	284

The information on language spoken while growing up was obtained by asking: "When you were growing up, what languages were usually spoken in your home?" In accordance with specification of the issue regarding cultural differences, the three-category answer "English, Spanish, Other" was collapsed into two -- English and Non-English. A distinct advantage in growing up speaking English is indicated by the fact that the estimated mean proficiency scores for respondents who did not speak English while growing up range from 238 to 254 -- a level far below that considered adequate for functioning in the workplace -- while the mean scores of those who spoke English while growing up range from 275 to 297. (See Table 2-2a.) The differences between the two groups of 37 to 43 points are highly critical in terms of being able to assure success in the workplace.

Among those who spoke English, ES/UI jobseekers did better than JTPA trainees in every type of literacy, whereas the picture is less clear-cut among those who did not speak English while growing up -- with a higher mean document score and lower mean quantitative score among JTPA trainees than among ES/UI jobseekers. This difference may reflect the presence among ES/UI jobseekers of a large number of older immigrant workers with continuing language handicaps and unfamiliarity with the workplace culture of this country, as compared with the JTPA population and its large number of bilingual youths.

Household income appears to be correlated with mean proficiency scores in both JTPA and ES/UI populations. (See Table 2-2a.) As much as 61 percent of JTPA program participants came from households with less than $10,000 of income, while only 33 percent of ES/UI jobseekers were in this category. In contrast, at the upper income range, 46 percent of ES/UI jobseekers came from households with $15,000 or more income and only 22 percent of JTPA participants were from households at that level. In order to focus more precisely on relationships between family financial capability and literacy, we examine changes in mean proficiency score by household income per person. Table 2-2b presents the results. Clearly, on a per capita basis, household income is more strongly correlated with literacy. A clear break is observed between the lowest per-capita income class and the rest of the classes, and there is a mild tendency for proficiency scores to rise with income level.

Since household income contains income of the respondent as well as of others in the household, this positive relationship between household income per member and proficiency scores could mean either that family financial capability is positively related with respondent's literacy or that the literacy level of the respondent is determining his or her own income-earning capability. In an attempt to zero in on the relationship of family financial capability to respondent's literacy level, we examined the relationship between household income per member and proficiency scores among the 16-20 and 16-25 age groups with the assumption that, at these levels, respondents are likely to be secondary earners of the family and hence, per-capita household income reflects family financial capability more than earnings of the respondent. Table 2-2c presents a comparison of the mean proficiency scores of different per-capita household income classes for these two age groups. Within each of the groups, there is a consistent tendency for the proficiency score to rise with income level, lending support, albeit mildly, to the idea of literacy as a product of family consumption demand.

As Table 2-3 shows, there is a distinct difference between white and other ethnic groups in literacy proficiency. While the average scores among white respondents range from 282 to 307 -- a level considered adequate to perform in the workplace -- the estimated mean scores among black and Hispanic respondents range from 239 to 263, scores which are inadequate in the workplace. If we indicate the proficiency gap by one minus the ratio of a mean score of an ethnic group to the corresponding mean score of whites expressed in percentage terms, the gap is greatest for Hispanics of the ES/UI population in prose comprehension (i.e., the average prose-comprehension score among Hispanic ES/UI jobseekers is only 79 percent of the average score among white ES/UI jobseekers). Seriousness of literacy deficiency among blacks and Hispanics is indicated by the substantial proficiency gap of 10 to 20 percent. Even the narrowest gap is almost 10 percent for black JTPA trainees in prose comprehension. The proficiency gaps are greater among ES/UI jobseekers than among JTPA trainees in each literacy area, reflecting the relative homogeneity of the latter in terms of age and other factors that equalize literacy. Undoubtedly, these wide deficiencies are due at least in part to differences in schooling and other concomitant factors. The net literacy gap attributable to ethnic difference will be estimated in the next section.

White ES/UI jobseekers are more proficient than white JTPA trainees with respect to each of the three literacy areas. In comparison, the mean scores for black participants are virtually the same between the two programs. Hispanic ES/UI jobseekers are less proficient than Hispanic JTPA trainees. Further, in two areas, prose comprehension and document literacy, Hispanics in the ES/UI program are less proficient than their black counterparts, with mean scores of 244 and 239 versus 261 and 251 respectively.

2. Schooling and Family Literacy Activities

Along with schooling (see Table 2-4), we include a dichotomous variable indicating whether or not the individual possesses a high school diploma or GED. This is to evaluate the effect personal traits, such as drive and motivation, have on one's learning. Family literacy practices are represented by two variables indicating the availability of two types of reading materials when respondents were going to school. These dichotomous variables were constructed from responses in the survey to questions pertaining to the availability of various reading materials and information sources at home -- newspaper and magazines; and/or more than 25 books, an encyclopedia, or a dictionary. The question asked of respondents was: "Which of the following materials (written in English) did you have in your home while your were in high school?" Respondents were to answer "Yes" or "No" to each of the six items -- newspaper, magazines, more than 25 books, encyclopedia, dictionary, and personal computer. From responses to this question, we created a variable to indicate

Table 2-3: Mean Literacy-Proficiency Scores -- Personal Characteristics

	Prose				Document				Quantitative			
	JTPA		ES/UI		JTPA		ES/UI		JTPA		ES/UI	
		%*		%*		%*		%*		%*		%*
Ethnic Group:												
White	290	-	307	-	282	-	300	-	287	-	306	-
Black	263	91	261	85	250	89	251	84	253	88	255	83
Hispanic	258	89	244	79	250	89	239	80	252	88	249	81
Other	274		268		262		278		257		286	
Gender:												
Male	274		287		271		282		278		291	
Female	291		295		277		285		282		289	

* Ratio to white

Table 2-4: Mean Literacy-Proficiency Scores -- Schooling

	Population Mix		Proficiency Score					
			Prose		Document		Quant.	
	JTPA (%)	ES/UI (%)	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
Schooling:								
0-8 years	6.9	3.0	240	206	235	201	234	220
9 up to 12 years	33.5	18.3	261	263	254	258	257	263
High School Grad.	37.2	32.3	289	292	278	286	283	292
Post High School Voc./Trade Ed	4.8	5.4	299	293	289	287	294	294
Some College	8.4	14.0	305	312	293	304	300	309
College Graduate	9.1	27.0	333	337	314	326	327	333
	100.0	100.0						
High School Graduate:								
H.S. Dropout (without GED)	32.2	18.0	248	246	243	241	245	248
H.S. Diploma or GED (no college)	67.8	82.0	296	304	284	297	290	303
	100.0	100.0						

whether newspapers or magazines were available at home, with the purpose of representing family literacy activity at a relatively low level. The second variable was intended to be a somewhat more demanding indicator, showing the availability of over 25 books, an encyclopedia, or a dictionary. Admittedly, neither of these two variables is a particularly rigorous index of family literacy practice; in fact, a very small proportion (about 2.5 percent) of all observations in the sample reported not having any of these reading materials at home when they were going to school (i.e., "No" in both variables). As Table 2.5 shows, there is virtually no difference in the proficiency scores between those who reported having magazines and newspapers at home and those who reported having 25 or more books, an encyclopedia, or a dictionary. Nevertheless, the importance of having literacy materials is attested to by the fact that, with both indicators, there is a substantial difference in the proficiency score between those who had these reading materials and those who did not.

Respondents' schooling information was obtained by asking: "What was the last grade of public or private school you completed?" The 10 levels of schooling that were identified, from which respondents were to choose one, were the same as those pertaining to mother's schooling. For this analysis, they were collapsed into six categories. Mean proficiency scores by schooling are quite consistent with what one would expect -- i.e., a steady increase in scores with each higher educational level. (See Table 2-4.) It is noted here that mean scores in all literacy areas for both populations associated with less than high school completion are 263 or below, scores which are considered inadequate for functioning in the workplace. In comparison, scores of those with a high school diploma or more schooling are 278 or above -- adequate in the workplace. The literacy problem of those not completing school is even more evident in the comparison between high school drop-outs (without a GED) and those with a high school diploma or GED. We note also that average scores of those with some college education (without graduating) are considerably higher than those with post-high school vocational or trade education. Assuming that the number of years spent in either type of schooling is similar between the two groups, this suggests that the academic training provided by at least a few years of college contributes more to one's workplace literacy, which emphasizes general reasoning power and ability to utilize information, than the specific skills training offered by vocational and trade education.[43]

3. Current Literacy Activities and Lifestyles

Respondents' current literacy-related activities and lifestyles are discerned from the answers to two questions: "How often do you read a newspaper in English -- every day, a few

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[43] It is very possible that students who go on to college are better educated substantively in high school than those who do not. This selection may explain the higher literacy level of those with some college education.

Table 2-5: Mean Literacy-Proficiency Scores -- Family Practices in Youth and Current Lifestyles

	Population Mix		Proficiency Score					
			Prose		Document		Quant.	
Variable	JTPA (%)	ES/UI (%)	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
Magazines and Newspaper Availability:								
No	7.1	6.4	268	257	255	243	266	260
Yes	92.9	93.6	285	293	275	287	282	293
	100.0	100.0						
Over 25 Books, Encyclopedia, or Dictionary Availability:								
No	4.7	4.2	258	244	251	230	251	246
Yes	95.3	95.8	285	292	275	285	281	292
	100.0	100.0						
Reading Newspaper in English:								
Every Day	44.5	53.5	286	298	275	290	282	295
Few Times A Week	32.7	28.2	292	290	283	284	289	289
Once A Week	14.4	10.9	273	282	265	276	270	286
Less Than Once A Week	5.6	5.4	273	263	267	261	266	277
Never	2.9	2.0	240	235	222	229	235	248
	100.0	100.0						
TV Watching:								
None	2.1	4.8	275	298	263	289	267	300
Up to Hour A Day	12.8	21.2	285	303	277	295	283	305
1 up to 2 Hours	21.5	25.9	289	297	278	291	284	298
2 up to 3 Hours	19.2	20.6	280	294	271	287	275	292
3 up to 4 Hours	15.9	15.8	282	288	271	280	275	284
4 up to 5 Hours	10.4	4.7	276	283	265	277	268	278
6 Hours or More	17.5	7.0	267	269	260	264	260	264
	100.0	100.0						

times a week, once a week, less than once a week, or never?" and "How many hours do you usually spend watching television each day?" These questions, clearly, touch on a very limited phase of a respondent's literacy related-life and would not produce comprehensive information on the quantity as well as the quality of the respondent's literacy-related activities. Nonetheless, inasmuch as both newspapers and television can be important tools for sharpening one's literacy skills, the intensity of their use is expected to be related to literacy proficiency. With regard to television, however, there is a general awareness that habitual and excessive TV watching, especially of entertainment programs of a superficial nature, dulls the intellect and the motivation for independent thinking. In this sense, the intensity of TV watching could be negatively related to literacy.

A large majority of the respondents in each program (about 80 percent) read a newspaper in English at least a few times a week. Overall, the intensity of newspaper reading appears definitely to be positively correlated with literacy. In particular, the proficiency scores of those who read a few times a week or more are generally far higher than those who read less. The proficiency scores of those who read a newspaper less than once a week or never indicates that these respondents, who comprise seven to eight percent depending on program, are quite inadequate to function in the workplace. In addition, it is striking that, while the mean proficiency score in every literacy area is clearly correlated with the intensity of newspaper reading among ES/UI jobseekers, there seems to be some ambivalence among JTPA program participants about the benefit of reading a newspaper every day compared with reading only a few times a week. Specifically, mean proficiency scores among JTPA participants who read a newspaper every day are consistently lower than those of JTPA participants who read a newspaper only a few times a week. There is no such uncertainty among ES/UI jobseekers.

The two populations are similar in terms of the proportion of individuals who spend one to four hours watching TV; however, they differ at each end of the scale. Specifically, JTPA program participants are far more concentrated than ES/UI jobseekers in excessive TV watching of four hours or more (28 percent) while, in comparison, a substantially larger proportion of ES/UI jobseekers either do not watch TV at all or spend only a moderately greater amount of time (one hour or less) watching TV than the JTPA participants (26 percent versus 15 percent). Above one hour per day, TV watching is negatively correlated with proficiency scores, while up to one hour of TV watching is distinctly associated with higher proficiency scores than not watching TV at all. This correlation between proficiency scores and the amount of TV watching may actually be explained by some underlying variable -- for example, that individuals with low proficiency are disadvantaged in finding jobs and hence end up spending a lot of time in front of television sets. However, to the extent that television watching may have a negative effect on literacy, the large proportion of unemployed workers in the two ETA client populations who spend what seems to be an enormous amount of time on TV watching (e.g., over 40 percent of the JTPA population and almost 30 percent of ES/UI participants watch TV over three hours a day) poses a challenge to the education and training community.

4. Job Requirements

The information collected regarding job requirements pertains to actual tasks performed and to respondents' perceptions of what the job entails. Data were obtained from responses to three questions: "How often did you read and/or use information from each of the following on your job -- reports or journal articles, forms, letters, diagrams, or schematics?", "How often did you have to write up or fill out each of the following for your job -- memos, business letters, reports, forms, bills, or invoices?", and "Considering all aspects of your most recent job, rate each of the following skills and abilities on a scale of one to five according to their importance in performing your job effectively -- reading, writing, working with numbers (mathematics), talking clearly to others, and listening well to others." The five-level response to the first two of these questions (i.e., every day, a few times a week, once a week, less than once a week, never) was collapsed for this analysis into two levels (never and all other). Table 2-6 presents mean proficiency scores by the degree of job requirement, together with the estimated population distributions.

A large majority of program participants (79 percent in JTPA and 88 percent in ES/UI) read or used reports, forms, letters, or diagrams on the job at least to some extent. Similarly, the majority of participants (74 percent in JTPA and 84 percent in ES/UI) reported having performed tasks on the job involving writing memos and letters or filling out forms and reports. These job requirements are distinctly related to proficiency scores. It is particularly noteworthy that the average proficiency scores of those who reported never having performed these tasks range from as low as 250 to 274 -- clearly inadequate to function in the workplace. In comparison, the mean scores of those who performed these reading and writing tasks on the job ranged from 278 to 295 -- adequate in the workplace.

Talking and listening skills are apparently more paramount than reading, writing, or math skills among respondents of either program. While 8 to 18 percent, depending on the program, of the unemployed workers consider reading, writing, or math unimportant for their job, only 2 to 5 percent consider talking or listening unimportant. In comparison, as much as 73 to 85 percent, depending on the program, regard talking and listening skills as very important, while only 44 to 65 percent consider reading, writing, and math skills very important. Awareness of the importance of these different skills is associated with a positive change in proficiency scores. Proficiency scores of those who reported these skills being unimportant are, with a few exceptions, at levels inadequate for functioning in the workplace. Mean proficiency scores of those who consider these skills "pretty important" or "very important," pulled together for this analysis under "very important," range from the upper 280's to almost 300, which implies that their literacy level is generally quite adequate in the workplace. In contrast, the mean scores of those who reported these skills as being "somewhat important" or "important," combined for this analysis into one category as "important," are in the 260's to 270's with respect to talking and listening skills -- scores which are by no means adequate. With respect to the reading, writing, and math skills, scores are largely in the upper 270's and 280's. Thus, not sur-

Table 2-6: Mean Literacy-Proficiency Scores -- Job Requirements

Variable	Population Mix		Proficiency Score					
			Prose		Document		Quant.	
	JTPA (%)	ES/UI (%)	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
Using Reports:								
No	20.9	11.8	274	260	262	250	270	261
Yes	79.1	88.2	287	295	278	288	283	294
Filling Forms, etc:								
No	25.9	16.3	270	266	262	260	269	270
Yes	74.1	83.7	289	295	278	288	284	295
Importance/Reading:								
Not Important	15.3	8.2	279	266	269	260	275	266
Important	34.3	30.4	283	280	274	276	282	285
Very Important	50.4	61.4	292	301	282	293	288	299
(Non-respondents)*	-	-	261	265	251	258	252	260
Importance/Writing:								
Not Important	18.0	10.0	276	267	269	261	278	269
Important	38.5	33.4	287	285	278	280	285	288
Very Important	43.5	56.5	292	300	280	293	287	299
(Non-respondents)*	-	-	261	265	251	256	252	261
Importance/Math:								
Not Important	15.0	9.6	278	266	266	261	271	270
Important	31.8	25.2	288	287	277	278	283	286
Very Important	53.2	65.2	290	298	281	291	289	298
(Non-respondents)*	-	-	261	266	251	258	252	261
Importance/Talking:								
Not Important	4.8	3.4	282	267	267	263	279	268
Important	22.3	17.1	279	273	271	269	277	278
Very Important	72.9	79.5	290	297	279	289	287	296
(Non-Respondents)*	-	-	262	266	253	259	253	259
Importance/Listening:								
Not Important	1.9	1.9	268	262	265	259	278	262
Important	18.4	12.8	274	273	266	265	271	274
Very Important	79.8	85.3	291	295	280	288	287	296
(Non-respondents)*	-	-	260	266	252	258	253	259

* Missing observations in the sample number 347 among 2,498 JTPA participants and 137 among 3,273 ES/UI jobseekers.

prisingly, workers who engage in jobs that are demanding in the areas of reading, writing, and math -- the traditional academic skills -- are more proficient in literacy than those in jobs that stress talking and listening skills. Nevertheless, talking and listening skills are an essential component of workplace requirements, as attested to by a positive relationship between mean proficiency scores and the degree of importance perceived by workers.

5. Workers' Self-Assessment of Skill Levels

Information regarding program participants' self-assessment of their skill levels was obtained through the questions "Did you feel your reading skills were good enough for your job?" (the same question was asked for writing and for mathematics) and "Do you think you could get a better job if you received additional training in English?" (The same question was asked for mathematics.) Table 2-7 presents mean proficiency scores by response to these questions. Most respondents consider their skills good enough for performing the jobs they held prior to the interviews though a decidedly larger number felt their skills were better in reading than in math. Self-assessment in each skill area is substantiated by average proficiency scores: mean scores of those who felt their skills were not good enough ranged from the 220's to 240's in reading, 243 to 262 in writing, and 248 to 265 in math; in comparison, mean scores of those who considered their skills good enough were generally in the upper 280's to 290's.

About two-thirds of the participants in either program felt they could get a better job with additional training in reading or writing, while 70 percent (ES/UI) and 79 percent (JTPA) felt the same about additional training in mathematics. The mean proficiency scores of these individuals are significantly lower than those of the individuals who felt no need for additional training – ranging for the former from 264 to 281, indicating inadequacy to perform in the workplace. The relatively large number of respondents who realize the need for additional training, and their low proficiency scores, suggest an unmet demand for additional academic training in reading and math.

C. STATISTICAL ANALYSIS OF THE DETERMINANTS OF LITERACY

1. Analytical Framework

From earlier discussion in this chapter, it is evident that the structure of the conceptual model is recursive in nature. While personal and family characteristics as well as schooling are given, the effects of the variables that pertain to literacy requirements on the job and to the workers' self-assessment regarding qualifications for jobs are, in large part, a function of past literacy achievement. Let WLT_t be the workplace-literacy proficiency score in time t where $t=0$ or 1; Z be a vector of K number of personal and family characteristics, including schooling and the characteristics of the community; and LA_t be a

Table 2-7: Mean Literacy-Proficiency Scores -- Self Assessment

Variable		Population Mix		Proficiency Score					
				Prose		Document		Quant.	
		JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI	JTPA	ES/UI
		(%)	(%)						
Skills Good Enough:									
Reading:	No	3.2	4.0	224	226	222	228	244	242
	Yes	96.8	96.0	290	295	279	287	286	294
		100.0	100.0						
(Don't Know)*		-	-	260	262	251	257	250	256
Writing:	No	5.6	8.3	251	262	243	254	253	262
	Yes	94.4	91.7	290	295	271	288	287	295
		100.0	100.0						
(Don't Know)*		-	-	258	263	249	257	249	258
Math:	No	8.2	7.1	265	259	255	248	260	253
	Yes	91.8	92.9	289	295	279	288	287	296
		100.0	100.0						
(Don't Know)*		-	-	261	263	254	258	253	257
Can Get Better Job if Improved in:									
English:	No	33.4	42.7	308	314	290	307	303	317
	Yes	66.6	57.3	272	281	270	273	275	280
		100.0	100.0						
Math:	No	20.7	30.6	298	317	295	309	302	316
	Yes	79.3	69.4	280	272	264	265	270	272
		100.0	100.0						

* Individuals in the sample who responded "Don't know" number 375 among 2,498 JTPA participants and 166 among 3,273 ES/UI jobseekers.

vector of M number of literacy-related activities both at home and at work, and of other variables that are determined by the past level of literacy. Then, the kind of relationship between proficiency score and a group of relevant variables, which we have identified, is represented by a set of equations:

$$WLT_0 = Zd_0 + e_0 \text{ .... } (1)$$

$$LA_1 = ZD_1 + b_1WLT_0 + w_1 \text{ .... } (2)$$

$$WLT_1 = Zd_1 + LA_1a_1 + c_1WLT_0 + e_1 \text{ ... } (3),$$

where Z is (1 x K), d is a (K x 1) coefficient vector, LA_t is (1 x M), D_t is a (K x M) coefficient matrix, and a_t is a (M x 1) coefficient vector. (Subscript i to denote the individual is omitted in order to simplify the presentation.)

Equation (1) indicates that the initial level of literacy is composed of the part that is explainable by personal and family characteristics, which are exogenous, and of the part unaccounted for by these variables. Equation (2) indicates that the intensity of various literacy-related activities consists of three parts -- i.e., the part accounted for by personal and family characteristics, the part determined by initial literacy proficiency, and the part not accounted for by either group of variables. Equation (3) indicates that current literacy proficiency can be decomposed into four parts -- i.e., the part explained by personal and family characteristics, the part explained by various literacy-related activities, the part explained by initial literacy proficiency, and the part unexplained by any of the identified variables.

Substituting (1) in (3),

$$WLT_1 = Z(d_1 + c_1d_0) + LA_1a_1 + e_1 + c_1e_0$$

$$= Zd_3 + LA_1a_1 + e_3 \text{ ....} (4)$$

where $d_3 = d_1 + c_1d_0$ and $e_3 = e_1 + c_1e_0$.

In the absence of observed data on preceding-period literacy-proficiency scores, the structural system represented by Equations (1) through (3) is not identified. We can estimate the role of both types of variables in determining current literacy proficiency by Equation (4). It is clear, however, that estimated regression coefficient (d_3) would be a cumulative effect of the personal and family characteristics and would be composed of the direct effect and the indirect or cumulative effect (through the previous literacy level).

Furthermore, it must be cautioned that the ordinary least square (OLS) estimate of coefficient a_1 in Equation (4) is potentially biased upward if LA_1 and error term e_3

(or error terms e_0 and w_1) are positively correlated. This situation can occur as a result of a correlation between particular choices of literacy-related activities (e.g., job requirements, TV watching, newspaper reading, etc.) and unobserved activities affecting literacy proficiency score. For example, high math content of jobs, which stimulates workers' quantitative skills, may also occur hand-in-hand with high incidence of math training required or voluntarily taken on-the-job and off-the-job.

In the present analysis, omitted variable bias due to correlation between e_0 and w_1 could be serious in a population comprised of a large group of experienced workers. Among these workers, it is quite likely that job requirements in specific skill areas have prompted them to receive appropriate training. However, in the present analysis, we assume that the effect of such omitted variables is minimal, since a large number of related variables are included in the regression analysis. Thus, remaining errors (w_1) are assumed to be uncorrelated with e_0. Nevertheless, it is important to be mindful of possible upward bias in interpreting the estimate of effects of the literacy-related activities on current-period literacy.

2. Regression Results

This section presents the estimations of Equation (4), using the variables identified in subsection 1. This enables us to find out whether the "gross" relationship between each of these variables and the proficiency scores observed in the one-way analysis of Section B are carried over into a significant "net" relationship when effects of the concomitant variables are controlled.

Because we suspect that the relationship between these variables and literacy proficiency are inherently different between males and females (or, because there are numerous unaccounted-for variables that make the responses of literacy proficiency to the changes in these variables differ between male and female), a separate analysis is carried out for each sex.

Of the variables identified in the preceding section, those pertaining to family background, personal characteristics, schooling, and family literacy practices in early youth are exogenous to the current literacy levels of workers. In other words, they might have exerted an impact on the workers' present literacy proficiency -- but not the other way around. (These variables are represented by the vector Z in the model presented above.) In comparison, the variables that pertain to the workers' current literacy-related lifestyles, job requirements, and self-assessment regarding literacy are endogenous in the sense that while they affect current literacy levels of workers, they might themselves have been influenced by past literacy levels.

The large number of relevant variables that were identified earlier makes it very cumbersome to present the analysis in a single sweep. So, for expediency, we carry out our analysis in two stages. First, we evaluate the relationships between proficiency scores and exogenous variables by a multiple regression approach. This evaluates the "net effects" of exogenous variables on literacy. Second, we regress the residuals from the first regression on the endogenous variables (i.e., the literacy-related activities). This enables us to gain insight into the net relationship between each variable and literacy proficiency when we control for not only the variables in the second regression but also for those in the first. For example, the second regression evaluates the degree of association between literacy and the intensity of newspaper reading, holding constant the extent of TV watching, and other endogenous and predetermined variables. In other words, the regression equations to be estimated are:

First Stage: $WLT = Zd_3 + e_4$ ....(5)

$=> EstWLT = Zd_3$

Second Stage: $RWL = LA_1a_1 + e_5$ ....(6)

where $RWL = WLT - EstWLT$.

One assumption we make is that none of the exogenous variables is correlated with any of the endogenous variables. This is a rather strict assumption, especially given the selection of variables in the present analysis; and if it does not hold, the first stage regression explains that part of variation which should be attributable to the variables in the second stage regression. In other words, the analysis of the residuals from the first stage regression (or the dependent variable in the second stage regression) overcontrols for first stage variables because, to the extent exogenous and endogenous variables are correlated, the first stage regression is likely to have accounted for at least a part of the effects of endogenous variables on workplace literacy. Thus, this two-stage approach tends to be conservative in assessing the importance of second stage variables. This means, of course, that the explanatory power of significant variables in the second stage analysis would be even greater than our results would show.

The results of the first stage regression are given on Tables 2-8a through 2-10b; and the results of the second stage regression are presented on Tables 2-11a through 2-13b. (See pages 113-118.) The dependent variable (regressand) in each of the first-stage regressions is the proficiency score in one of the three literacy areas, and the explanatory variables (regressors) are those listed under A through D on Table 2-1.[44] The dependent

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[44] Household Income was excluded from these regression analyses, despite its seeming relevance as shown in the previous section, for two reasons: (1) Early preliminary regression analysis including this variable resulted mostly in coefficients not statistically significant. This may partly be due to a high correlation between Household Income and some of the other included variables;

Table 2-8a: Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Prose Comprehension (JTPA)

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	4.04	.95	-1.07	-.36
H.S. Grad.	-.27	-.07	2.63	.90
Voc./Trade Ed.	17.87	1.79	9.58	1.34
College				
Up to 2 Yrs.	13.34	1.49	6.59	1.03
2 Yrs. or More	2.00	38	12.33	2.60
Spoke English in Youth	20.88	2.53	22.28	3.80
Ethnic Group:				
Black	-31.46	-8.82	-28.27	-10.81
Hispanic	-23.65	-3.21	-19.64	-4.15
Other	-9.35	-1.60	19.99	2.89
Schooling:				
9-12 Years	17.09	3.10	17.91	3.63
H.S. Grad.	33.59	5.12	19.10	3.29
Voc./Trade Ed.	41.68	4.83	27.76	3.94
College				
Up to 2 Yrs.	49.67	6.48	28.33	4.40
2 Yrs. or More	63.26	8.48	52.18	7.98
H.S. Dip. or GED	21.73	4.91	27.27	7.16
Newspaper or Magazine at Home in Youth	10.80	2.29	4.73	1.42
Books, Encyclopedia, Dictionary Available in Youth	14.49	2.24	6.52	1.03
No Illness or Disability	19.10	6.84	12.38	5.11
Age:				
21-25 Yrs. Old	-1.86	-.42	5.91	1.64
26-31 Yrs. Old	9.39	2.16	7.48	2.12
32-45 Yrs. Old	4.99	1.13	6.14	1.81
46 Yrs. or Older	-1.01	-.18	-6.08	-1.36
Military Exp.	15.53	4.89	10.95	1.78
Per Capita Educational Exp./State Average Pay	- .30	- .01	10.14	.33
Constant	176.16	13.41	209.39	18.83
Adj R^2	.4699		.3645	

Table 2.8b: Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Prose Comprehension (ES/UI)

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	8.67	2.47	6.20	2.09
H.S. Grad.	16.14	5.46	9.06	3.42
Voc./Trade Ed.	24.68	4.06	21.24	3.28
College				
Up to 2 Yrs.	25.15	4.72	8.34	1.55
2 Yrs. or More	26.59	7.15	15.98	4.36
Spoke English in Youth	1.32	.35	-.81	-.20
Ethnic Group:				
Black	-41.99	-14.18	-42.98	-15.98
Hispanic	-38.68	-10.64	-48.08	-14.07
Other	-35.60	-7.20	-44.37	- 8.83
Schooling:				
9-12 Years	14.24	2.05	29.88	2.86
H.S. Grad.	25.85	3.34	39.31	3.71
Voc./Trade Ed.	26.56	3.11	43.42	3.97
College				
Up to 2 Yrs.	41.72	5.09	50.95	4.70
2 Yrs. or More	49.28	6.35	72.24	6.76
H.S. Dip. or GED	9.03	2.04	17.09	3.74
Newspaper or Magazine at Home in Youth	6.16	1.59	6.74	1.87
Books, Encyclopedia, Dictionary Available in Youth	.47	.08	5.06	.81
No Illness or Disability	11.74	4.97	10.74	4.43
Age:				
21-25 Yrs. Old	1.16	.30	-10.36	-2.76
26-31 Yrs. Old	1.14	.29	-.24	-.07
32-45 Yrs. Old	1.36	.35	2.05	.58
46 Yrs. or Older	3.56	.80	-3.20	-.79
Military Exp.	9.38	4.18	11.19	1.68
Per Capita Educational Exp./State Average Pay	37.88	1.20	-25.61	-.86
Constant	223.11	19.22	231.53	17.25
Adj R^2	.4407		.4851	

Table 2-9a: Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Document Literacy (JTPA)

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	3.64	.95	-.23	-.09
H.S. Grad.	3.85	1.10	.89	.34
Voc./Trade Ed.	23.66	2.62	-1.16	-.18
College				
Up to 2 Yrs.	15.83	1.96	1.70	.29
2 Yrs. or More	.39	.08	13.42	3.14
Spoke English in Youth	9.82	1.32	4.02	.76
Ethnic Group:				
Black	-35.46	-11.01	-34.35	-14.53
Hispanic	-29.06	-4.44	-27.65	-6.47
Other	-18.03	-3.42	6.92	1.11
Schooling:				
9-12 Years	12.26	2.46	10.08	2.26
H.S. Grad.	21.91	3.70	5.35	1.02
Voc./Trade Ed.	32.20	4.13	16.25	2.55
College				
Up to 2 Yrs.	35.28	5.09	11.67	2.00
2 Yrs. or More	47.54	7.06	30.98	5.24
H.S. Dip. or GED	27.80	6.95	28.40	8.24
Newspaper or Magazine at Home in Youth	4.15	.97	1.70	.57
Books, Encyclopedia, Dictionary Available in Youth	7.78	1.33	8.11	1.41
No Illness or Disability	12.85	5.10	5.46	2.49
Age:				
21-25 Yrs. Old	-4.13	-1.05	4.92	1.51
26-31 Yrs. Old	3.98	1.01	4.16	1.30
32-45 Yrs. Old	1.53	.38	-3.55	-1.16
46 Yrs. or Older	-18.14	-3.52	-20.89	-5.16
Military Exp.	16.95	5.91	27.17	4.88
Per Capita Educational Exp./ State Average Pay	5.16	.15	26.68	.96
Constant			235.00	23.38
Adj R^2	.4877		.3740	

Table 2-9b: **Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Document Literacy (ES/UI)**

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	9.56	2.91	7.19	2.56
H.S. Grad.	16.14	5.82	8.70	3.46
Voc./Trade Ed.	23.60	4.14	17.81	2.90
College				
Up to 2 Yrs.	28.45	5.69	-.26	-.05
2 Yrs. or More	29.95	8.59	13.07	3.75
Spoke English in Youth	16.84	4.71	12.12	3.20
Ethnic Group:				
Black	-46.79	-16.86	-41.56	-16.25
Hispanic	-33.06	-9.70	-34.78	-10.71
Other	-3.74	-.81	-25.08	-5.25
Schooling:				
9-12 Years	13.13	2.01	33.44	3.37
H.S. Grad.	14.84	2.04	37.37	3.71
Voc./Trade Ed.	22.91	2.86	37.10	3.57
College				
Up to 2 Yrs.	26.00	3.38	56.89	5.53
2 Yrs. or More	34.26	4.71	63.80	6.27
H.S. Dip. or GED	21.14	5.09	22.08	5.09
Newspaper or Magazine at Home in Youth	2.53	.70	14.61	4.28
Books, Encyclopedia, Dictionary Available in Youth	10.60	1.83	3.82	.64
No Illness or Disability	19.88	8.98	12.85	5.57
Age:				
21-25 Yrs. Old	-3.60	-.98	.08	.02
26-31 Yrs. Old	-3.32	-.91	4.08	1.20
32-45 Yrs. Old	-3.89	-1.07	7.43	2.22
46 Yrs. or Older	-6.18	-1.49	-5.63	-1.46
Military Exp.	9.68	4.60	6.61	1.04
Per Capita Educational Exp./ State Average Pay	12.78	.43	-21.49	-.76
Constant	198.31	18.23	192.62	15.09
Adj R^2	.4828		.4737	

Table 2-10a: Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Quantitative Literacy (JTPA)

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	-3.93	-.98	1.31	.45
H.S. Grad.	.01	.00	3.15	1.10
Voc./Trade Ed.	1.70	.18	-4.60	-.65
College				
Up to 2 Yrs.	13.49	1.56	-.77	-.12
2 Yrs. or More	1.34	.27	12.67	2.70
Spoke English in Youth	19.64	2.51	11.85	2.04
Ethnic Group:				
Black	-36.57	-10.80	-34.24	-13.22
Hispanic	-31.99	-4.57	-22.48	-4.80
Other	-23.73	-4.28	-2.54	-.37
Schooling:				
9-12 Years	16.25	3.10	14.97	3.06
H.S. Grad.	31.02	4.98	11.69	2.04
Voc./Trade Ed.	31.70	3.87	22.89	3.28
College				
Up to 2 Yrs.	38.55	5.29	25.58	4.01
2 Yrs. or More	54.58	7.71	41.21	6.36
H.S. Dip. or GED	24.84	5.90	29.26	7.75
Newspaper or Magazine at Home in Youth	1.65	.37	7.16	2.17
Books, Encyclopedia, Dictionary Available in Youth	19.06	3.10	8.76	1.39
No Illness or Disability	15.92	6.00	13.13	5.47
Age:				
21-25 Yrs. Old	-5.85	-1.41	10.54	2.96
26-31 Yrs. Old	6.36	1.54	7.74	2.21
32-45 Yrs. Old	7.76	1.85	8.67	2.58
46 Yrs. or Older	-5.25	-.97	-2.80	-.63
Military Exp.	14.18	4.70	13.06	2.14
Per Capita Educational Exp./State Average Pay	-21.52	-.58	50.07	1.64
Constant	198.09	15.88	201.46	18.30
Adj R^2	.4919		.3673	

Table 2-10b: Relationship Between Literacy and Personal and Family Characteristics (First Stage Regression) -- Quantitative Literacy (ES/UI)

Variable	Male		Female	
		t		t
Mother's Schooling:				
9-12 Years	5.23	1.58	.74	.26
H.S. Grad.	13.54	4.87	4.19	1.61
Voc./Trade Ed.	29.83	5.22	12.16	1.91
College				
Up to 2 Yrs.	40.17	8.00	9.64	1.82
2 Yrs. or More	31.49	9.00	5.54	1.54
Spoke English in Youth	4.24	1.18	12.14	3.10
Ethnic Group:				
Black	-41.73	-14.98	-44.18	-16.70
Hispanic	-31.77	-9.29	-38.88	-11.57
Other	-14.12	-3.03	-16.34	-3.31
Schooling:				
9-12 Years	4.03	.62	19.22	1.87
H.S. Grad.	13.52	1.86	24.33	2.33
Voc./Trade Ed.	17.81	2.22	26.82	2.50
College				
Up to 2 Yrs.	14.60	7.72	35.57	3.34
2 Yrs. or More	34.20	7.30	49.66	4.72
H.S. Dip. or GED	20.30	4.86	19.65	4.38
Newspaper or Magazine at Home in Youth	2.13	.58	8.78	2.48
Books, Encyclopedia, Dictionary Available in Youth	14.45	2.48	14.82	2.40
No Illness or Disability	20.71	9.32	12.19	5.11
Age:				
21-25 Yrs. Old	6.83	1.86	4.47	1.21
26-31 Yrs. Old	6.49	1.77	8.87	2.52
32-45 Yrs. Old	5.67	1.55	14.43	4.17
46 Yrs. or Older	8.42	2.02	5.18	1.30
Military Exp.	6.18	2.92	10.65	1.63
Per Capita Educational Exp./State Average Pay	24.03	.81	27.88	.95
Constant	208.23	19.06	196.72	14.90
Adj R^2	.4779		.4441	

variable in the second stage regression is the residuals from the corresponding first stage regression (i.e., the difference between actual proficiency score and "predicted" score based on the model estimated by first stage regression), and the independent variables are those listed under E through G on Table 2-1.

With the exception of Per Capita Educational Expenditure Per Dollar of State Average Pay in second stage regression, explanatory variables are entered in regressions as qualitative variables, and each original variable was separated into several categorical (dummy) variables. Thus, the regression coefficient for each dummy variable indicates the incremental amount of the score attributable to being in the corresponding category compared with being in the category that is excluded. For example, the Schooling variable, with six schooling levels, was converted into five dummy variables to be compared with the excluded reference level -- i.e., each level, from "9-12 years" through "College 2 years or more," is to be compared with "0-8 years," the reference class. On Table 2-8a, for instance, the coefficient of 17.09 for "9-12 years" among male JTPA participants means that holding everything else constant, those with 9 to 12 years of schooling score 17.09 points higher in prose-comprehension literacy than those with 0 to 8 years of schooling. Similarly, 33.59 for "High School Graduates" means that high school graduates score 33.59 points more than those with 0 to 8 years of schooling.[45]

a. The First Stage Regression

The outcome of the regression is quite consistent with our initial expectation, and estimated coefficients are either statistically significant with the right sign or, if not statistically significant, with no wrong sign. Let us examine the results:

(1) Parent's Schooling

The importance of parent's schooling is clearly shown by the positive and statistically significant regression coefficients for the dummy variables indicating various levels of

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and (2) In order to bring out the "family financial capability effect," in accordance with the initial hypotheses in Section 1, the sample observations to be included in the regression analysis have to be limited to the youngest subset. This would reduce the sample size drastically enough to prevent meaningful multivariate statistical analysis.

[45] Thus, for the entire set of variables included in the regression, the estimated proficiency score that corresponds to the joint occurrence of the excluded categories of all qualitative variables (i.e., "Mother's schooling=0-8 years" plus "Not speaking English in youth" plus "White" ...), and the value zero of the continuously measurable variable (i.e., "Per capita educational expenditure divided by statewide average pay") is indicated by the constant term in the regression -- for example, 176.16 for JTPA males in prose comprehension. (See Table 2-8a.)

mother's schooling -- i.e., a generally high positive correlation between mother's schooling and proficiency scores. With the exception of quantitative literacy among JTPA males, for whom none of the coefficients for the dummy variables pertaining to mother's schooling is significant, mother's schooling is highly correlated with the proficiency score. While a positive and significant coefficient for any one of the five dummy variables supports the view that mother's schooling makes a difference, a stronger statement can be made when the coefficients are successively larger with higher level of mother's schooling. On this score, the relationship between mother's schooling and literacy seems to vary between the two ETA client populations and between male and female.

It is among male ES/UI jobseekers that mother's schooling is most prominently and consistently correlated with literacy proficiency. With respect to all three types of literacy, all but one of the coefficients are highly significant statistically and large and the size of the coefficient increases with the increase in mother's schooling. Relative to the base category "0-8 years," respondents with mothers with 9 to 12 years of schooling are advantaged by 10 points or less in the proficiency score, while those with mothers with at least some college education are estimated to do better by 25 to 40 points. In comparison, the relationship is not as consistent among female ES/UI jobseekers. Mother's schooling is indeed important in this sub-population, with a difference of 12 to 21 points -- depending on literacy area and the effect that having mothers with a post-high school vocational or trade education has over those with mothers with 0 to 8 years of schooling. However, this group is distinct in that the effect of mother's schooling seems to taper off after the vocational or trade education level of mother's schooling. Nevertheless, the highly significant and large coefficient for the "Vocational/Trade Education" dummy variable over the base category, as well as over the two lower levels of schooling, strongly supports the importance of parent's education.

Among males in the JTPA population, regression coefficients are significant only for the "Vocational/Trade Education" category in prose comprehension and the "Vocational/Trade Education" and "Up to 2 Years of College" categories in document literacy. None of the coefficients in the quantitative literacy regression is significant. The coefficients that are significant are very large -- i.e., 17.87, 23.66, and 15.83. Thus, in this sub-population, we can still conclude that mother's schooling is highly correlated with literacy, though not as systematically as in the case of male ES/UI jobseekers. The least impressive outcome is with respect to the sub-population of JTPA females, for whom only the highest level of mother's schooling, "2 Years or More of College," makes a difference with statistically significant coefficients in the range of 12 to 13. Overall, therefore, it is reasonable to say that parental schooling and whatever it stands for (e.g., intellectual stimulus, aspirations for the children, etc.) are manifest in workers' literacy proficiency.

(2) Language Spoken in Childhood

The regression coefficient indicates the advantage of a child's speaking English while she or he is growing up. In the ES/UI program, this factor is highly significant for both males and females with respect to document literacy; for females with respect to quantitative skills; and for males with respect to document literacy. In the JTPA program, this factor is significant with respect to prose comprehension and quantitative literacy among both males and females. Thus, the findings lend some support to the notion of the importance of familiarity with the culture and language of the workplace.

(3) Ethnic Background

The reference category in the ethnic group variable is "White." The regression result shows that both the black and Hispanic sub-groups in the JTPA and ES/UI populations are significantly disadvantaged in every area of literacy. In the JTPA program, being a black male is associated with a 31.5-, a 35.5-, and a 36.6-point disadvantage in prose comprehension, document literacy, and qualitative literacy respectively compared to being a white male. Similarly, among JTPA females, the disadvantages of being black in these literacy areas are 28.3, 34.4, and 34.2 points respectively. Among ES/UI jobseekers, the white/black differences are even more dramatic -- i.e., 42, 46.8, and 41.7 points among males and 43, 41.6, and 44.2 points among females in prose comprehension, document literacy, and quantitative literacy respectively.

The regression coefficients for Hispanics indicate that their relative literacy is nearly as discouraging. Compared with white males, Hispanic males in JTPA are at disadvantages of 23.65, 29.6, and 32 points in prose comprehension, document literacy, and quantitative literacy respectively; and Hispanic males in the ES/UI population are disadvantaged by 38.7, 33.1, and 31.8 points respectively in these areas. The white/Hispanic gaps among females are, in JTPA, 19.6, 27.6, and 22.5 points and, in ES/UI, 48.1, 34.8, and 38.9 points in the three areas respectively.

The seriousness of the magnitude of these literacy gaps among whites, blacks, and Hispanics can easily be grasped by observing that a difference of 30 to 40 or more points constitutes as much as 10 to 15 percent of the average scores of these populations. Such a gap can be critical in that it may determine whether one can function adequately in the workplace. For example, given the estimated average score of male JTPA participants in prose comprehension of about 278, the 31.5-point disadvantage of black male participants places them at a literacy level far below what is adequate for functioning in the workplace. Another way to look at the seriousness of this difference is to realize that these gaps of 30 to over 40, are in most cases, comparable to the gap associated with the difference between having only 0 to 8 years of schooling and completing high school. Such literacy gaps are especially serious since they are net differences after effects of schooling and since, to the extent we have been able to account for, effects of home environment have been controlled for. Thus, the gaps suggest a valuable role that adult education and other supplemental education programs outside of formal schooling can play in giving a boost to the proficiency of minority workers. They also point to the efficacy of workplace-literacy training as an integral part of ongoing job-training programs. The value of such a combination of literacy training and specific job training was evidenced in the analysis in the previous chapter of the economic achievements of unemployed workers.

The implications of these large literacy gaps among black and Hispanic unemployed workers in terms of the future productivity of the economy is enormous. With the projection of a drastic increase in non-white and immigrant workers in the labor force by the year 2000, the U.S. economy will be heavily dependent on the economic performance of these minority workers.[46] Clearly, therefore, these large literacy gaps among minority workers pose a serious challenge to the education and training community in this country.

(4) Schooling

The importance of schooling is demonstrated by the positive and significant coefficients for the five schooling variables as well as by the successively larger coefficient with increases in educational level.[47] For example, for males in the JTPA population, all the coefficients are highly significant; 9 to 12 years of schooling is associated with 17 points of net advantage over 0 to 8 years of schooling, whereas high school completion is associated with a 34-point advantage. At the upper extreme, two years or more of college is associated with a 63-point advantage over the base category.

(5) High School Diploma or GED Attainment

The variable High School Diploma or GED was included in the analysis to capture the potentially unique quality associated with completion of schooling or achievement of an educational credential as against being a high school dropout. Such traits would include tenacity, motivation, aspiration, and discipline. In every case, having a high school diploma or GED is associated with a nearly 20- to 30-point net advantage in proficiency scores over being a dropout.

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[46] See, for example, William B. Johnson and Arnold E. Packer, Workforce 2000, Hudson Institute, Indianapolis, Ind., 1987, p.95.

[47] With respect to both the "Schooling" and "High School Diploma or GED Attainment" variables, we need to be careful in interpreting the regression results since, in the present model, we ignored the possibility of self-selection. In case of schooling, whereas we wished to evaluate the effect of additional schooling on the literacy proficiency, we were not able to separate it from the effect of literacy on schooling. Similarly, the coefficient for "High School Diploma or GED" does not separate the effect of the diploma (or GED) on literacy from the effect of literacy on the drive to pursue a high school diploma (or GED). This is potentially a serious flaw in our approach, since it seems as likely that smart individuals have additional drive to pursue schooling or diploma (and benefit more than others who attain additional schooling) as that schooling and diploma make people smarter.

(6) Availability of Literacy-Related Materials at Home

The impact of having literacy materials at home while growing up is assessed by the inclusion of the two variables -- i.e., having a newspaper and magazines at home, and having 25 books or more, a dictionary or an encyclopedia. Except for the JTPA population in document literacy, one or both of these variables is highly correlated with proficiency scores of individuals in either population. The impact of these variables is as much as a 19-point advantage among JTPA males in quantitative literacy. The important point made by this regression is that even with the use of such an inclusive indicator as reading-material availability, the coefficients are either highly significant or, if not significant, at least have the right sign. This fact strongly suggests that having reading materials at home while children grow up is a very important factor in cultivating their literacy.

(7) Age

The regression yields a mixed picture regarding the relationship between age and proficiency score. No age effect is observed among ES/UI males with respect to prose comprehension and document literacy; there seem to be diverse responses of age groups to literacy depending on type of literacy. Specifically, mid-age groups (i.e., 26-to-31 and 32-to-45) do better than the youngest age group (i.e., 20 years or younger) in prose comprehension and quantitative literacy in the JTPA population and in quantitative literacy in the ES/UI population in general, lending some support to the idea that investment in learning continues throughout an individual's working life. However, no such relationship is discernible with respect to the remaining literacy types. At the same time, among JTPA participants, a large negative effect of being in the oldest age group (i.e., 46 years or older) is observed with respect to document literacy. This -- together with the fact that in all other cases except male ES/UI jobseekers in quantitative literacy, coefficients for "46 or Older" are statistically not significant (and mostly negative) -- suggests that learning (and investment in learning) tapers off as workers get older.

(8) Effect of Military Experience

A positive effect of military experience on workplace literacy is indicated by the generally large and significant coefficients. The fact that this variable is statistically significant for females, except for those in ES/UI in document literacy, as well as for males, when only 2 to 3 percent of females in these programs have had military experience, indicates the importance of the impact military experience has on literacy.

(9) A Summary Observation

The results of first stage regression are generally consistent with our hypotheses; we can safely conclude that the intergenerational transfer of literacy, as reflected in significant coefficients for parent's schooling and various variables representing home literacy environment, is an important source of variation in workplace literacy among individuals. In addition, we have confirmed that schooling is highly correlated with workplace literacy and is a vital source of individual literacy. The importance of schooling indicates that while workplace literacy emphasizes analytical ability and the ability to integrate available information, traditional learning of the three R's is the indispensable foundation for acquiring workplace literacy. We have also found weak support for the hypotheses regarding age variations in learning investments, formal or informal, with significant, positive regression coefficients for mid-age groups of the age variable and with tendency toward negative coefficients for the top (oldest) age group. Finally, we have found that both blacks and Hispanics are greatly disadvantaged relative to whites in every literacy-proficiency area -- even after schooling and other variables are held constant. The large literacy deficiency these groups suffer, together with the rapidly rising importance of minority groups in the U.S. labor force, will be a continuing challenge to this country in its quest for increased competitiveness through improved productivity of the workforce.

(b) The Second Stage Regression

The proficiency scores of individual respondent are compared with predicted scores, which are derived from the coefficients in the first regression. The difference between actual proficiency score and the predicted score (residual) is regressed, in second stage regression, on various endogenous variables. This enables us to understand the relationship between these variables, which have a mutually-determining relationship with literacy, and the proficiency score -- after the effects of predetermined variables are controlled for.[48] The endogenous variables to be examined fall into one of three categories: current literacy-related activities, the nature of job requirements, and the respondent's self-assessment regarding job requirement, and their literacy proficiency. (See Tables 2-11a through 2-13b.)

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[48] In interpreting the coefficient of determination in the second stage regression, one needs to be cautioned that since the regressand is the residual from the first stage regression, it does not indicate the proportion of variation in proficiency score explained by the variables in the second stage model. Rather, it is the proportion of the variation which is unexplained by the first stage regression and explained by the second stage regression variables; thus, the variation in literacy score explained by second stage regression is: (1 - R^2 in First Stage) times R^2 in Second Stage.

Table 2-11a: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Prose Comprehension (JTPA)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		-.76	-.26	6.56	2.85
Once/Week		-10.80	-2.46	-.38	-.13
Less Than Once/Week		-4.77	-.90	-9.88	-2.20
Never		-2.25	-.30	13.68	1.98
TV Watching:					
Up to 1 Hour/Day		-17.20	-2.08	2.36	.34
1 Up to 2 Hours/Day		-5.54	-.69	3.39	.50
2 Up to 3 Hours/Day		-14.95	-1.85	-3.64	-.53
3 Up to 4 Hours/Day		-11.58	-1.42	1.12	.16
4 Up to 5 Hours/Day		-10.17	-1.20	2.98	.42
6 Hours or More/Day		-19.34	-2.41	-4.30	-.62
On the Job:					
Use Reports, etc.		.68	.17	-2.55	-.79
Fill Forms, etc.		6.48	1.84	13.13	4.21
Importance on Job:					
Reading:	Not Important	20.14	.75	-2.85	-.06
	Important	14.68	2.66	4.41	.92
	Very Important	-2.75	-.79	3.23	1.13
Writing:	Not Important	-	-	10.80	.24
	Important	-9.37	-1.78	-3.82	-.88
	Very Important	2.27	.65	-5.72	-1.96
Mathematics:	Not Important	-	-	-24.69	-.84
	Important	11.10	2.34	7.44	1.97
	Very Important	6.57	2.04	2.80	1.09
Talking:	Not Important	26.38	1.30	37.68	1.47
	Important	14.78	2.01	7.92	1.33
	Very Important	2.12	.55	-4.68	-1.30
Listening:	Not Important	7.21	.23	-15.35	-.83
	Important	-31.00	-2.43	7.62	.73
	Very Important	-8.42	-2.10	3.79	.97
Skill Good Enough:					
Reading:	Yes	14.38	1.76	6.44	.68
	Don't Know	5.54	.38	17.41	.92
Writing:	Yes	10.90	1.71	4.60	.86
	Don't Know	-4.58	-.38	19.28	1.36
Math:	Yes	-4.90	-.90	10.23	2.47
	Don't Know	-29.55	-2.57	-28.13	-1.94
Can Get Better Job With Improvement in:					
	English	-14.57	-4.61	-15.17	-6.02
	Mathematics	5.91	1.78	5.45	1.77
Constant Term		-8.49	-.74	-24.74	-2.16
Adj R^2		.1295		.0938	

Table 2-11b: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Prose Comprehension (ES/UI)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		-7.38	-3.38	1.07	.52
Once/Week		-9.93	-2.92	1.22	.42
Less Than Once/Week		-9.71	-2.28	-9.98	-2.07
Never		-12.27	-1.60	-7.28	-1.13
TV Watching:					
Up to 1 Hour/Day		5.34	.89	1.46	.27
1 Up to 2 Hours/Day		1.37	.23	4.96	.91
2 Up to 3 Hours/Day		4.45	.74	2.74	.50
3 Up to 4 Hours/Day		11.85	1.94	-1.60	-.29
4 Up to 5 Hours/Day		6.77	.98	7.95	1.25
6 Hours or More/Day		-9.38	-1.40	-.05	-.01
On the Job:					
Use Reports, etc.		-3.08	-.88	-5.09	-1.50
Fill Forms, etc.		-.26	-.09	10.92	3.49
Importance on Job:					
Reading:	Not Important	87.93	1.58	68.27	1.80
	Important	-12.30	-2.56	-12.25	-2.07
	Very Important	-7.25	-2.64	-7.02	-2.59
Writing:	Not Important	-35.22	-.86	-5.45	-.17
	Important	5.23	1.15	16.65	3.20
	Very Important	5.82	2.21	.02	.01
Mathematics:	Not Important	-67.04	-3.65	-	-
	Important	-9.90	-2.86	-9.26	-2.48
	Very Important	-.59	-.25	2.22	.95
Talking:	Not Important	-	-	-26.72	-1.83
	Important	5.06	.70	5.86	.98
	Very Important	-10.27	-3.44	4.45	1.21
Listening:	Not Important	13.01	.47	-	-
	Important	18.04	1.76	-.69	-.08
	Very Important	3.19	.99	-1.02	-.25
Skill Good Enough:					
Reading:	Yes	17.16	2.80	43.54	5.60
	Don't Know	16.76	.78	30.34	1.93
Writing:	Yes	-3.62	-.87	-18.44	-3.56
	Don't Know	13.53	.97	-21.03	-1.31
Math:	Yes	5.63	1.28	1.68	.40
	Don't Know	-9.41	-.67	-15.22	-1.64
Can Get Better Job With Improvement in:					
	English	-17.24	-7.24	-11.20	-4.84
	Mathematics	6.58	2.68	.00	.00
Constant Term		-7.71	-.85	-26.17	-2.85
Adj R^2		.1376		.1030	

Table 2-12a: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Document Literacy (JTPA)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		2.82	1.05	3.94	1.93
Once/Week		-6.48	-1.61	.57	.22
Less Than Once/Week		-.86	-.18	-6.02	-1.52
Never		-9.22	-1.36	-17.51	-2.86
TV Watching:					
Up to 1 Hour/Day		-.06	-.01	.74	.12
1 Up to 2 Hours/Day		2.89	.40	1.44	.24
2 Up to 3 Hours/Day		-3.30	-.44	-1.60	-.26
3 Up to 4 Hours/Day		.61	.08	-7.40	-1.21
4 Up to 5 Hours/Day		-.80	-.10	2.07	.33
6 Hours or More/Day		-.69	-.09	-3.50	-.57
On the Job:					
Use Reports, etc.		4.94	1.34	9.06	3.18
Fill Forms, etc.		.79	.24	8.15	2.95
Importance on Job:					
Reading:	Not Important	2.75	.11	-7.05	-.18
	Important	9.15	1.82	4.02	.95
	Very Important	-7.06	-2.22	3.51	1.39
Writing:	Not Important	-	-	46.90	1.15
	Important	-3.98	-.83	3.34	.88
	Very Important	12.57	3.93	-5.78	-2.24
Mathematics:	Not Important	-	-	-105.48	-4.05
	Important	8.44	1.94	-1.79	-.54
	Very Important	.89	.30	-1.70	-.75
Talking:	Not Important	-23.83	-1.28	18.94	.84
	Important	-5.13	-.76	1.43	.27
	Very Important	1.22	.35	5.30	1.66
Listening:	Not Important	66.72	2.29	48.68	2.99
	Important	-4.64	-.40	12.94	1.40
	Very Important	-1.14	-.31	-3.41	-.99
Skill Good Enough:					
Reading:	Yes	12.57	1.68	4.20	.50
	Don't Know	-1.00	-.08	1.49	.09
Writing:	Yes	7.00	1.20	14.27	3.02
	Don't Know	-12.42	-1.12	7.89	.63
Math:	Yes	-6.70	-1.34	8.40	2.30
	Don't Know	-9.71	-.92	6.40	.50
Can Get Better Job With Improvement in:					
	English	-13.40	-4.63	-7.24	-3.25
	Mathematics	-1.66	-.54	-4.73	-1.73
Constant Term		-12.29	-1.17	-28.56	-2.82
Adj R^2		.1084		.1326	

Table 2-12b: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Document Literacy (ES/UI)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		-3.67	-1.77	6.60	3.47
Once/Week		-9.01	-2.78	12.27	4.55
Less Than Once/Week		2.33	.58	-6.19	-1.39
Never		-19.26	-2.64	10.98	1.84
TV Watching:					
Up to 1 Hour/Day		-2.64	-.46	15.40	3.03
1 Up to 2 Hours/Day		-4.98	-.88	20.68	4.12
2 Up to 3 Hours/Day		-6.86	-1.20	17.59	3.46
3 Up to 4 Hours/Day		-1.89	-.32	17.60	3.42
4 Up to 5 Hours/Day		-6.13	-.93	17.03	2.89
6 Hours or More/Day		-10.90	-1.71	16.02	2.86
On the Job:					
Use Reports, etc.		2.96	.89	2.31	.79
Fill Forms, etc.		-2.93	-1.01	7.96	2.75
Importance on Job:					
Reading:	Not Important	37.36	.70	40.30	1.16
	Important	-12.28	-2.69	-3.44	-.63
	Very Important	.63	.24	-8.13	-3.24
Writing:	Not Important	18.00	.46	25.00	.84
	Important	-3.51	-.81	4.92	1.02
	Very Important	2.78	1.11	2.16	.86
Mathematics:	Not Important	-54.09	-3.08	-	-
	Important	-4.49	-1.36	-8.22	-2.38
	Very Important	-3.71	-1.64	.92	.43
Talking:	Not Important	-	-	-21.20	-1.57
	Important	4.85	.71	5.36	.97
	Very Important	-3.02	-1.06	4.33	1.28
Listening:	Not Important	-9.37	-.36	-	-
	Important	23.88	2.45	-8.15	-.97
	Very Important	3.86	1.26	2.44	.65
Skill Good Enough:					
Reading:	Yes	3.17	.54	20.42	2.84
	Don't Know	1.87	.09	-14.50	-1.00
Writing:	Yes	1.24	.31	-2.17	-.46
	Don't Know	38.28	2.87	-6.10	-.41
Math:	Yes	8.43	2.00	10.36	2.63
	Don't Know	-21.17	-1.58	-.72	-.08
Can Get Better Job With Improvement in:					
	English	-16.93	-7.46	-8.10	-3.78
	Mathematics	5.00	2.14	-9.78	-4.18
Constant Term		1.50	.17	-43.72	-5.15
Adj R^2		.1042		.1494	

Table 2-13a: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Quantitative Literacy (JTPA)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		4.91	1.78	1.97	.89
Once/Week		-6.02	-1.46	1.35	.48
Less Than Once/Week		-4.12	-.82	-11.48	-2.65
Never		-1.80	-.26	1.35	.20
TV Watching:					
Up to 1 Hour/Day		-6.07	-.78	29.86	4.41
1 Up to 2 Hours/Day		.32	.04	25.80	3.93
2 Up to 3 Hours/Day		-5.07	-.67	25.42	3.82
3 Up to 4 Hours/Day		-4.79	-.62	23.62	3.55
4 Up to 5 Hours/Day		-5.22	-.66	22.04	3.18
6 Hours or More/Day		-10.21	-1.35	17.78	2.66
On the Job:					
Use Reports, etc.		9.90	2.62	1.74	.56
Fill Forms, etc.		1.73	.52	7.00	2.32
Importance on Job:					
Reading:	Not Important	55.91	2.20	-35.07	-.81
	Important	.65	.13	5.38	1.16
	Very Important	-6.46	-1.98	6.30	2.28
Writing:	Not Important	-	-	-12.85	-.29
	Important	7.15	1.45	6.14	1.47
	Very Important	7.73	2.35	-1.26	-.45
Mathematics:	Not Important	-	-	.76	.03
	Important	9.58	2.14	-9.64	-2.64
	Very Important	.80	.26	-1.54	-.62
Talking:	Not Important	-32.44	-1.70	35.62	1.44
	Important	13.15	1.90	-1.32	-.23
	Very Important	2.54	.70	1.27	.36
Listening:	Not Important	54.35	1.81	12.95	.73
	Important	8.81	.74	12.82	1.27
	Very Important	-5.42	-1.44	-2.94	-.78
Skill Good Enough:					
Reading:	Yes	-1.71	-.22	3.62	.40
	Don't Know	-32.79	-2.41	-14.14	-.77
Writing:	Yes	8.14	1.35	8.02	1.56
	Don't Know	-16.90	-1.49	15.30	1.11
Math:	Yes	-3.36	-.65	20.57	5.15
	Don't Know	-25.24	-2.33	15.00	1.07
Can Get Better Job With Improvement in:					
	English	-10.04	-3.37	-5.28	-2.17
	Mathematics	-5.66	-1.81	-13.53	-4.54
Constant Term		-1.26	-.12	-45.96	-4.16
Adj R^2		.1466		.1317	

Table 2-13b: Relationship Between Literacy Proficiency and Current Literacy Activities (Second Stage Regression) -- Quantitative Literacy (ES/UI)

Variable		Male		Female	
			t		t
Newspaper Reading:					
A Few Times/Week		-2.08	-1.01	8.07	4.15
Once/Week		-5.54	-1.73	11.10	4.03
Less Than Once/Week		9.33	2.33	-7.98	-1.75
Never		-10.27	-1.42	6.34	1.04
TV Watching:					
Up to 1 Hour/Day		-.85	-.15	17.45	3.36
1 Up to 2 Hours/Day		-10.50	-1.87	21.78	4.24
2 Up to 3 Hours/Day		-9.76	-1.72	17.31	3.34
3 Up to 4 Hours/Day		-6.38	-1.11	15.77	3.00
4 Up to 5 Hours/Day		-13.10	-2.01	15.45	2.57
6 Hours or More/Day		-22.92	-3.63	8.63	1.51
On the Job:					
Use Reports, etc.		-.41	-.12	-2.18	-.73
Fill Forms, etc.		-5.15	-1.80	5.10	1.72
Importance on Job:					
Reading:	Not Important	-10.79	-.20	56.55	1.59
	Important	-13.65	-3.02	-2.29	-.41
	Very Important	-3.39	-1.31	-4.13	-1.61
Writing:	Not Important	15.28	.40	46.78	1.54
	Important	-2.70	-.63	8.36	1.70
	Very Important	6.36	2.56	-1.13	-.44
Mathematics:	Not Important	-31.73	-1.83	-	-
	Important	-6.57	-2.01	-11.96	-3.40
	Very Important	-1.85	-.82	-2.48	-1.12
Talking:	Not Important	-	-	-52.92	-3.84
	Important	-1.66	6.77	-.83	-.15
	Very Important	-6.00	-2.13	10.13	2.94
Listening:	Not Important	29.17	1.12	-	-
	Important	23.74	2.46	-19.41	-2.26
	Very Important	3.20	1.05	-3.78	-.98
Skill Good Enough:					
Reading:	Yes	.14	.02	9.33	1.27
	Don't Know	1.48	.07	-19.48	-1.31
Writing:	Yes	12.07	3.06	-7.94	-1.62
	Don't Know	32.06	2.49	-18.37	-1.22
Math:	Yes	14.56	3.50	14.26	3.55
	Don't Know	-8.90	-.67	.07	.01
Can Get Better Job With Improvement in:					
	English	-9.71	-4.32	-8.94	-4.09
	Mathematics	-2.36	-1.01	-12.80	-5.35
Constant Term		-2.44	-.28	-21.33	-2.46
Adj R^2		.1262		.1794	

(1) Current Literacy-Related Activities

Two variables are included in the analysis in this area – namely, intensity of English-language newspaper reading and extent of television watching. Reading is a learning experience, and newspaper reading is no exception. From the standpoint of workplace literacy, a newspaper is a valuable tool of learning because it not only provides an opportunity for practicing reading and information-processing skills, but also exposes the reader to the up-to-date culture and languages of today's work environment. At the same time, frequency and type of newspaper reading is influenced by an individual's level of literacy. Thus, there is a mutually-reinforcing effect between literacy and newspaper reading. This is borne out by the regression result, which shows that in general, the less intensive the newspaper reading the lower the proficiency score. Compared with the base category "Reading Newspaper Everyday," the four categories of decreasing intensity of reading are associated with negative contributions to proficiency score or, among the four included categories, larger negative contributions to proficiency score -- i.e., there is a positive correlation between proficiency score and intensity of newspaper reading. With respect to prose-comprehension scores, for example, newspaper reading and literacy are clearly correlated among male ES/UI jobseekers as shown by the highly significant negative coefficients that tend to decrease (have larger negative values) with decreasing frequency of newspaper reading. In other cases, mutual effects of newspaper reading and literacy are not as clear-cut. Among ES/UI females, infrequent reading of a newspaper is associated negatively with proficiency score only with respect to "Less Than Once A Week" – about a 10-point disadvantage compared with "Reading Every Day." Among JTPA males, the negative effect of infrequent newspaper reading shows up in the "Once A Week" category, which is associated with a nearly 11-point disadvantage compared with "Reading Every Day." Only in cases of JTPA females in prose comprehension and of ES/UI females in document literacy is the expected relationship between literacy and newspaper reading not supported by the analytical result.

Literacy and the extent of TV watching are also mutually dependent, but the way they are interdependent is not as self-evident as in the case of newspaper reading, partly because the nature and quality of TV programs are quite diverse. News, cultural programs, and other informative programs may be watched by people who have already attained a certain level of literacy, while these same programs tend to stimulate and further widen one's intellectual horizon. At the same time, there are a large number of television programs that are not only of little educational value but are detrimental to intellectual growth, as expressed by concerns that children and young people spend too much time watching these types of programs.

This mixed expectation regarding the effects of TV watching is reflected in the regression results. On one hand, a negative mutual effect between literacy and TV watching is most clearly indicated in cases of JTPA males in prose comprehension and of ES/UI males in quantitative literacy, where statistically significant and large negative coefficients were obtained for three or more categories indicating different numbers of hours of TV watching. In particular, it is noteworthy that "6 Hours or More a Day" of TV watching is associated with as much as 19 and 23 points of net deficit in proficiency score compared with not watching TV at all. On the other hand, in cases of ES/UI males in prose comprehension, ES/UI females in document literacy, and JTPA and ES/UI females in quantitative literacy, regression results indicate that TV watching is positively correlated with proficiency score. In general, one can say that there is a positive relationship between TV watching and proficiency score among females and a negative relationship among males, perhaps reflecting the difference in the types of programs watched. The upshot of this analysis is that some television programs do have educational value and that selective watching of television does indeed have a positive effect on literacy. But as the cases of JTPA males in prose comprehension and ES/UI males in quantitative literacy show, excessive and non-discriminate TV watching is counterproductive.

(2) Job Requirements

Two types of data are included in analysis of literacy-related job requirements -- first, the nature of tasks actually performed, and second, the respondents' perception of the importance of different job traits. On job tasks actually performed, two questions were asked about the extent of such tasks as reading, using information, and filling out forms. For the purpose of the present analysis, the five-level responses to the questions regarding the two types of job task were compressed into two responses -- i.e., "Never" and the others combined. The resulting variables pertain to the two types of task: first, reading or using information from reports, journal articles, forms, letters, diagrams, or schematics; and secondly, writing up or filling out memos, business letters, reports, forms, bills, or invoices.

These tasks and literacy are mutually dependent; in other words, workers who engage in these tasks, compared with those who do not, are more proficient to start with and/or these tasks offer a challenge to strive and to improve proficiency.[49] This is mildly supported by the regression result: among JTPA females, the first type of task is associated with a 9-point advantage in the document-literacy score over not performing these tasks, and among JTPA males this type of tasks is associated with almost a 10-point advantage in quantitative-literacy score over not performing them. With respect to the second type of task, there is a distinctly positive association between it and proficiency in prose comprehension among both males and females in JTPA and females in ES/UI -- a 6.48-, a 13.13-, and a 10.92-point advantage respectively. Females in both JTPA and ES/UI who performed this type of job task excelled in document and quantitative literacy over those who did not. It is therefore reasonable to conclude that the mutually-reinforcing effect of job requirements and literacy is indeed powerful. This supports the view that "one rises to the occasion" and that placing a worker in a demanding job situation can have a beneficial effect in improving his or her proficiency.

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[49] As Katz points out, because of this selection issue the regression method used in the present study is inappropriate in identifying the causal relationship. Katz tested our result by reestimating using the two-stage least-square method. His finding shows "a strong and statistically significant relationship between job responsibilities ... and the information-processing skills measured by the document-proficiency index." This is consistent with our intuitive formulation. Arnold Katz, "Comments on Policy Implications," Conference on Literacy and the American Worker: Implications for Public Policy, College of William and Mary, Williamsburg, Va., April 1993.

In regard to worker perceptions of the degree of importance of different types of job task, the regression analysis included three dummy variables, "Not Important," "Important," and "Very Important," with the base category of "Don't Know." In this analysis, the "Don't Know" category was recognized as a distinct class rather than treated as "Missing Values," because of the systematic tendency of respondents who reported "Don't Know" to score lower than any other category. (See Table 2-6.) This finding, together with the large number of these respondents, suggests that reporting "Don't Know" is not a random phenomenon, as is usually the case for missing values, but that there is a unifying underlying factor. For example, in light of the consistently low scores of these respondents, one can hypothesize that their preparation for work is so inadequate that they are not even aware whether reading, writing, and mathematics are important for performing their jobs.

Each regression coefficient in this group of variables indicates the net difference from the "Don't Know" category. For example, the statistically significant coefficient of 14.68 for "Important" under "Reading" for the JTPA males (Table 2-11) means that JTPA males who considered reading important in the performance of their jobs scored better by 14.68 points than those who did not know whether reading was important. Thus, in order to know whether workers' considering tasks important makes a difference in proficiency score, it is necessary to compare the coefficients for "Important" (or "Very Important") and "Not Important."

This multiple regression analysis produced a picture regarding the relationship between literacy and workers' perception of specific job tasks that is somewhat different from that given in Table 2-6. The gross relationship shows that in every case, those who considered a task important achieved higher proficiency scores than those who considered it unimportant. However, once the effects of other included variables are held constant, the relationship between scores and the assessments of the importance regarding any one job task becomes less clear or even reversed. For example, while ES/UI males who report reading to be important or very important achieved distinctly higher prose-comprehension scores in gross terms than those who reported "Not Important" (Table 2-6), regression coefficients for these three groups of ES/UI males are -12.30, -7.25, and 87.93 (Table 2-11). Even if we discount the coefficient 87.93, which is not significant, and consider it as zero, the statistically significant and negative coefficients, -12.30 and -7.25, indicate that ES/UI males who perceive reading as an important part of their job are apt to score lower, in net terms, than those who do not.

Generally, with the exception of JTPA males in document literacy and JTPA females in quantitative literacy, those who considered reading important are associated with lower scores in every literacy area than those who considered reading unimportant. In contrast, where there is a sufficient number of observations, both those who considered writing important and those who considered mathematics important scored higher in most cases than those who did not. This apparent difference between the reading task, on one hand, and the writing and mathematics tasks, on the other, may reflect differences in the specificity and rigor of the tasks. Self-selectivity in performance of the writing and mathematics tasks, as well as demands of the jobs involving these tasks, may produce a positive association. The results for "Talking" and "Listening" are inconclusive.

(3) Self-Assessment

Respondents' self-assessment as to whether their skills in reading, writing, and mathematics are good enough, and the response "Don't know," were entered into the regression as two dummy variables. In each skill area, the coefficient for the first dummy variable, "Yes," indicates the difference in proficiency score associated with feeling good enough relative to feeling not good enough. The coefficient for the second dummy variable stands for the difference between those who did not know whether they were good enough and those who thought they were not good enough. For example, among ES/UI males, those who felt that their writing skills were good enough to be effective on their jobs scored 12.07 points more than those who did not; and those who replied that they did not know scored 32.06 points higher than those who felt their writing skills were not good enough. (See Table 2-13b.)

Overall, the self-confidence, as manifest in the response "Yes," is positively correlated with high proficiency scores relative to scores of respondents who replied "No." Specifically, significant and positive regression coefficients for the reading skill variable are obtained for JTPA males and ES/UI females in prose comprehension and document literacy; for writing skills, for JTPA males in prose comprehension, JTPA females in document literacy, and ES/UI males in quantitative literacy; and, for mathematics skills, for JTPA females in all three literacy areas, ES/UI females in document and quantitative literacy, and ES/UI males in quantitative literacy. Except for ES/UI females in writing skills, for whom the coefficients were negative for prose comprehension and quantitative literacy, all other coefficients for the dummy variable for "Yes" are not significant. Thus, one can safely conclude that in general, positive self-assessment of skills is associated with a literacy advantage. Those who answered "Don't know" were generally disadvantaged relative to those who answered "No," as evidenced by the prevalence of negative (where significant) coefficients.

Results are mixed regarding the response to the question of whether additional training can help in getting better jobs. On one hand, those who responded "Yes" with respect to English were uniformly disadvantaged in proficiency relative to those who answered "No," as attested by the consistently negative and statistically significant coefficients for English. The only difference between males and females and between the two programs is the size of disadvantage, which ranged from a low of 5.28 for JTPA females in quantitative literacy to a high of 17.24 for ES/UI males in prose comprehension. Generally, the gap seems to be greater among males. On the other hand, with respect to mathematics, both males and females in JTPA, as well as males in ES/UI who felt that they could use additional training, are associated with a net advantage in prose comprehension over those who did not feel the need for additional mathematical training. In contrast, in regard to quantitative literacy, those who felt the need for additional training in mathematics are consistently disadvantaged relative to those who did not. The coefficients for mathematics are mostly negative and statistically significant, ranging from 5.66 to 13.53 points. Curiously, the results in document literacy seem to differentiate between males and females -- i.e., females in both JTPA and ES/UI who felt the need for additional training in mathematics seem to be disadvantaged relative to those who did not, whereas the picture is the opposite among ES/UI males.

D. CHAPTER SUMMARY AND CONCLUSION

The explanatory variables of workplace literacy in the regression analysis in this chapter may be summarized into four underlying determinants and several control variables. We would identify the four underlying determinants as motivation, self-awareness, schooling, and the use of literacy skills. The regression results help us evaluate the role of these factors in determining workplace literacy and the policy implications that flow from them. In addition, relevant observations can be made with respect to a few of the control variables, such as age and ethnic group. Let us summarize the findings.

1. Determinants of Literacy

The four fundamental factors underlying literacy achievements of individuals are desire to learn, awareness of how much (or how little) one knows, learning itself, and using what has been learned. The motivation to learn usually comes hand-in-hand with a sense of purpose and a grasp of the reason for learning, which greatly facilitate its effectiveness. Self-assessment of knowledge relative to what needs to be learned is actually the flip side of the motivation to learn. Frequently, realization of inadequacy in what we already know drives us to intensify our effort to learn. This self-assessment is important in that it defines the goal of learning as well as our present state of knowledge.

The central component of literacy proficiency is the act of learning itself -- be it through formal schooling or through literacy-related activities outside school. Finally, as one might suspect, the best way to be proficient in any skill is to use it. This is especially applicable in the case of workplace literacy. The acquisition of writing, reading, and mathematic skills becomes meaningful only when one has a feel for their use through repetitive applications at home or in the workplace, which, in turn, further develop, enhance, and sharpen these skills.

Of the four explanatory factors, motivation is the most difficult to measure directly; and we have proxied it by such variables as parent's schooling and the availability of reading and literacy-related materials at home while one was growing up – on the assumption that parental aspirations, as reflected in these variables, are translated into a child's drive for excellence and self-improvement. In addition, we included the indicator of whether or not the respondent had completed high school or a GED, which again might reflect motivation, drive, or tenacity. Awareness of one's literacy level was represented by two variables -- whether or not respondents thought their reading, writing, and mathematics skills were good enough for their jobs (and, importantly, whether they knew if their skills were good enough) and whether respondents thought they could get better jobs with an improvement in such skills.

In addition to number of years of schooling, we included military service experience as an indicator of formal learning. Use of acquired literacy skills may occur both at home and at work. Thus, current literacy-related activity, such as newspaper reading and television watching, would be expected to have an impact on one's literacy proficiency just as literacy-related job tasks would also be expected to give the worker an opportunity to learn and polish his or her literacy skill.

With these statistical measures of fundamental determinants of workplace literacy, our analysis has yielded the following findings:

(a) Motivation

The importance of family literacy practices at early ages is attested to by the statistically significant relationships between literacy-proficiency score and mother's schooling and between proficiency score and the extent of available reading materials at home in childhood. The importance of parent's schooling is especially evident amongjobseekers who go through the ES/UI system. In this population, for example, prose-comprehension score increases systematically with level of mother's schooling -- i.e. among males, compared with those whose mothers had less than 9 years of schooling, respondents whose mothers had more years of schooling scored 8.7 points (9 to 12 years), 16.1 points (high school graduates), 24.7 points (vocational or trade education), 25.2 points (up to two years of college) and 26.6 points (two years or more of college) higher respectively. The corresponding figures for females are 6.2, 9.1, 21.2, 8.3, and 16 points respectively. Results for the other two literacy scales are not as dramatic; nevertheless, they consistently show importance of parents' schooling on respondents' literacy.

Availability of reading materials at home in childhood was represented by two indicators -- namely, whether or not the respondent had a newspaper and magazines at home, and whether or not the respondent had more than 25 books, an encyclopedia, or a dictionary at home while the respondent was in high school. Neither of these is a very rigorous standard of literacy activity; yet even at these levels, the results suggest strongly that availability of these materials in youth is a factor in developing literacy in individuals. For example, among female ES/UI jobseekers, having a newspaper and magazines at home in youth is associated with an almost 7-point advantage in prose-comprehension score, a 15-point advantage in document-literacy score, and an almost 9-point advantage in quantitative-literacy score. Also, among male JTPA trainees, availability of books, an encyclopedia, or a dictionary is associated with a 14-point advantage in prose-comprehension score and a 19-point advantage in quantitative-literacy score, while among male ES/UI jobseekers, it is associated with an 11-point advantage in document-literacy score and a 14-point advantage in quantitative-literacy score.

Possession of a high school diploma or GED is definitely correlated with literacy. With the exception of male ES/UI program participants in prose comprehension, for whom a high school diploma or GED made only a 9-point difference, the advantage of having a high school diploma or GED ranged from almost 20 points to nearly 30 points. Since schooling was included as a separate variable in the same regression, we suspect that this result on high school diploma and GED reflects, to a large extent, the element of drive, determination, and tenacity associated with completing school or passing the GED.

(b) Self-awareness As a Key Factor

The survey asked respondents whether they felt they were good enough in reading, writing, and mathematics skills (separately) for their jobs and whether they thought they could get better jobs by receiving further training in reading, writing, and math. An overwhelming majority of respondents (80 percent or more among JTPA trainees and over 85 percent among ES/UI jobseekers) felt that their skills were good enough. Also, a majority of respondents thought that they could find better jobs with improvements in reading, writing, or mathematics -- i.e., 67 percent (JTPA) and 57 percent (ES/UI) in reading and writing and 79 percent (JTPA) and 69 percent (ES/UI) in math.

This indicates that a substantial number of unemployed workers in the two survey populations feel comfortable with their literacy skills to perform the jobs they had held but are also aware that they need to improve in order to get the jobs they want. This is suggested by a somewhat contradictory result that, on one hand, those who feel that their skills (in reading and math respectively) are good enough for their past jobs generally tend to excel in prose comprehension and quantitative literacy respectively over those who do not and, on the other hand, those who feel that they can find better jobs with additional training are distinctly less proficient in literacy than those who do not. Apparently, therefore, many unemployed workers in these programs are aware of their limitations regarding literacy relative to the kind of jobs they wish to have.

What we were unable to capture definitively from this result is the positive effect of knowing one's own limitations, which can be argued to drive a person to strive and to improve her or his level of literacy. One potential evidence of such a phenomenon may be that respondents who "did not know" whether their skills in reading, writing, and mathematics were good enough for the jobs they had held tend often to be much less proficient than those who thought their skills were not good enough. This does seem to suggest that awareness even of one's lack of proficiency is better than not having such awareness. A more rigorous test of such a hypotheses would require longitudinal information.

(c) Schooling

Given that the three R's are the foundation of workplace literacy, it is not surprising that formal schooling is by far the most important explanatory factor in literacy proficiency. It is noteworthy not only that compared with the minimal schooling level at less than 9 years, each higher level of schooling is associated with a large advantage in proficiency score, but also that the gain in proficiency score, as educational level rises, is consistently positive and large. One example will suffice to illustrate the general pattern: among male JTPA trainees, having 9 to 12 years of schooling is associated with a 17-point advantage in prose-comprehension score, and this advantage increases successively to 34, 42, 50, and as much as 63 points with increase in educational level to high school completion, post-high school vocational and technical education, two years or less of college, and two years or more of college.

Another source of structured learning for many young people is military experience; and, since what is taught in the military is directly tied to hands-on experience, it may be even more relevant to workplace literacy than formal schooling. This point may be borne out by the consistently large advantage those respondents with military experience show in proficiency scores over those without it. Among both males and females of both programs, the advantage associated with having military experience ranged from 6 points to as much as 27 points.

(d) Use of Literacy Skills

Both the home environment and the workplace offer opportunities to use and improve upon the literacy skills one has already acquired. Among many literacy-related activities at home are newspaper reading and television watching; and, among indicators of workplace activities likely to affect literacy, are specific tasks performed and the respondents' perceptions of the importance of reading, writing, and mathematics in work performance. Information on specific tasks at work was two-fold: whether the respondent used reports, forms, letters, and diagrams on the job; and whether the respondent wrote or filled out forms, memos, reports, and bills.

(1) Literacy-related Activities at Home

There is a general pattern of positive correlation between newspaper-reading frequency and proficiency score and of negative correlation between intensity of television watching and proficiency score. The result of multivariate analysis is less unambiguous and yields a curious pattern. Newspaper reading is definitely correlated with proficiency score among ES/UI males in prose comprehension, where proficiency scores of those who read "a few times a week," "once a week," "less than once a week," and "never" are successively lower by 7.4, 9.9, 9.7, and 12.3 points respectively than scores of those who read a newspaper every day. However in other instances, the pattern is not as consistent, indicating the presence of complex factors affecting behavior of individuals. For example, among JTPA females, while those who read "less than once a week" are estimated to be less proficient by 9.9 points than those who read every day, scores of those who "never" read are higher by 13.4 points (and statistically significant). Overall, the net relationship between newspaper reading and literacy is positive among males while it is not so clear among females.

The outcome of the regression analysis shows also that the net relationship between television watching and literacy varies by sex. In general, where it is statistically significant, the net relationship is negative among males and positive among females. This contradictory outcome is likely to reflect differences between men and women in type of person watching television extensively and in type of programs watched. It suggests that television watching could be a useful tool for cultivating literacy skill depending on how TV is used.

(2) Literacy-related Activities on the Job

Findings regarding job requirements are somewhat mixed. On one hand, a simple comparison of average proficiency scores shows a clear pattern that those who use literacy skills and those who perceive the importance of literacy skills on the job are more proficient than others. This is consistent with the view that the use of these skills and high literacy levels are interdependent -- i.e., that workers with literacy skills are drawn to jobs that require these skills and/or that workers at the jobs requiring literacy skills acquire and sharpen their skills through use.

On the other hand, the results of the multiple regression analysis appear contradictory with respect to these two indicators of literacy activities on the job -- i.e., actual use of reports or filling out of forms and respondents' perceptions of the importance of reading, writing, and mathematical activities at work. With respect to actual use, the regression results are consistent with our expectation that use of skills and proficiency score are positively correlated. Actual job use of literacy skills (over non-use) is associated with an advantage of 5 points to as many as 13 points in proficiency score depending on literacy scale, program type, and gender. Use of literacy skills evaluated here was in two areas -- using reports, forms, letters, and diagrams; and filling out (writing) forms, memos, reports, and bills.

At the same time, regression results for workers' perceptions of the importance of various types of literacy at work appear contradictory. The response of "important" or "very important" to questions of how respondents perceived reading, writing, and mathematics skills for performance on the job is associated with either an advantage or disadvantage in proficiency score depending on gender, type of program, and literacy scale. For example, among JTPA males, those who considered reading important on their jobs attained about five points less in prose-comprehension score than those who did not consider it important, while they excelled in document literacy by as much as 9 points. This seemingly inconsistent outcome may be explained by: first, perceptions of importance of these skills reflecting respondents' inadequacies relative to job requirements rather than actual levels of importance of these skills. In this case, inadequacies of those who perceived literacy skills as important may be highlighted, and may thus result in their being less proficient than those who consider these skills as unimportant. Secondly, it is likely that those for whom these skills are actually important on the job are also those who used reports or filled out forms on the job, in which case the role of the use of literacy skills would be reflected, in this multiple regression, in results for variables indicating use of reports and filling out of forms.

Overall, therefore, we would consider the outcome of the analysis regarding literacy-related activities on the job to be consistent with the view that their use on the job plays a positive role in enhancing workers' literacy skills.

(e) Ethnic and Age Differences and Literacy

(1) Ethnic Differences

One area which demands serious attention is the wide literacy gaps between whites and blacks and between whites and Hispanics. Compared with whites, being black is associated with a 30-point to 46-point deficit depending on gender and literacy area; and being Hispanic is associated with as much as a 48-point deficit. The importance of ethnic differences in explaining workplace literacy is second only to that of schooling. Concerns over the seriousness of these deficits should be heightened when we note that average scores for these two groups in the three literacy areas range between 240 and a little over 260 -- the level that is considered clearly inadequate for meaningful participation in the workplace. These estimated literacy gaps for minority workers are net of other factors that explain the white-black or white-Hispanic difference -- for example, schooling. Given that minority workers are expected to be a fast-growing segment of the labor force, the large deficits in workplace literacy of these groups of workers pose a profound challenge to the education and training community.

(2) Age and Literacy

There is an apparent inverted, U-shaped relationship between age and literacy proficiency. This suggests that investment in workplace literacy either on the job or outside reaches its peak in middle age and declines afterward. It also indicates that the human capital stock accumulated through past experience and learning is not sufficient to ensure keeping up with current workplace literacy requirements unless it is supplemented by continuous updating in the form of training and reeducation. This points to the importance of training and retraining programs for older workers, especially when they constitute an ever-increasing segment of the workforce and an important source of productivity.

2. Conclusion

These outcomes point to the fundamental nature of the literacy problems of unemployed workers and to long-range and basic solutions.

Above all, our data support the contention that reading, writing, and arithmetic skills are the backbone of primary and secondary school education and still the mainstay among the factors contributing to improvement of workplace literacy. Obviously, without these fundamental skills to build upon, the ability to reason and process information can hardly be expected to develop. For the two DOL programs under question, JTPA and ES/UI, the implications for improvement may be to incorporate remedial reading, writing, and math as integral parts of overall training and job-search assistance programs. This point is particularly pertinent to JTPA, for which the survey found that more than 40 percent of those who seek training in this program have not completed high school (more than 20 percent among jobseekers in the ES/UI system).[50] Also, clearly, this finding is one additional evidence attesting to the value of government-sponsored adult education and of private sector initiatives such as Literacy Volunteers of America.

At the same time, workplace literacy for a large proportion of the high school graduates in these two populations is quite inadequate. For example, of those who have a high school diploma, almost 30 percent of JTPA trainees and 38 percent of ES/UI jobseekers performed at Level 1 or 2 in prose comprehension -- levels considered to be insufficient to perform in today's workplace.[51] This suggests that while skills in the three R's are vital as the springboard for developing workplace literacy, life-context training in critical thinking and information processing would be a valuable complement to job-training programs designed for unemployed workers.

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[50] See Table 2-4.

[51] Kirsch, Jungeblut, and Campbell, op. cit., p. 27.

Our analysis also confirms the importance of inter-generational transfer, not only of literacy skills themselves, but also of an individual's outlook toward learning and self-improvement -- including intellectual curiosity, motivation, aspiration, drive, and tenacity. The acquisition of reading, writing, and mathematical skills is clearly aided by parental guidance and a favorable family environment; but ability to engage in critical thinking, with these skills as the base, is greatly enhanced by their continuous use. This is why literacy-related family activities in one's childhood are critical in determining later growth in one's workplace literacy. Such activities may be as simple as having reading materials around the home, developing a regular newspaper-reading habit, and having stimulating dinnertime conversations.

This finding is applicable specifically to the youth component of participants in employment and training programs. Given that disadvantaged youths comprise much of the client populations of Department of Labor programs, the kind of environment that is described here and that fosters growth of literacy skills must be provided, with the unified efforts of families, communities, and training service providers. A good example of such an environment is residential youth programs, such as the Job Corps, where participants can be immersed in a favorable learning environment 24 hours a day.

Our data also provide some evidence that self-awareness regarding one's literacy skills is positively related to literacy proficiency. Individuals who are alert about what they know vis-à-vis what they need to know on the job or for desirable jobs tend to have a greater motivation and initiative to achieve a higher level of literacy skills than individuals who are not alert. In addition, knowledge of one's level of literacy is likely to enhance efficiency in planning appropriate training and in learning itself. From the program standpoint, therefore, this result points to the importance of the role of periodic workplace-literacy assessments of participants in employment and training programs. Educational Testing Service has created for the Department of Labor an assessment instrument in the three areas of literacy (prose comprehension, document literacy, and quantitative literacy); and the literacy assessment of individual participants using such instruments should greatly enhance the efficiency of both training and job-search assistance.

Based on this analysis, it is evident that literacy-related activities both at home and at work are important determinants of individual literacy levels. While in some instances, individuals engage in activities that require high levels of literacy because they have already attained substantial literacy skills, in other instances, individuals acquire and improve their literacy skills by actually using them in activities that require these skills. This point is particularly relevant in regard to critical-thinking ability, an essential component of workplace literacy and an ability which becomes sharper with greater use. This would be an argument for close coordination in any job-training program between academic curricula and job-skills training in such a way as to make the former meaningful to working life. For example, for some trainees in machine operation, safety instructions or a machine-operating manual, which are directly tied to their prospective work, can be a tool of reading (or prose-comprehension) proficiency training while having a real-life meaning to them. There is a significant pay-off to consciously designing job-training programs which integrate literacy and job training in this manner, so that individuals can cultivate their literacy in workplace contexts. Not only would such cultivation enhance workers' proficiency in specific job skills, but it would improve their adaptability in a rapidly changing economy.

Finally, objectives of the ideal job training and assistance program would include the short-range goal of placing unemployed workers in jobs as well as the long-range goal of ensuring their long-term employment stability and career growth. In today's economy, which is characterized by rapid changes in demand and technology, these goals can be realized only by endowing workers with the critical-thinking ability while training them in specific job skills. Only with such a combination of broad portable skills, which are what workplace literacy represents, and of specialized job skills to meet current demands, can a worker get a career started and cope with the challenge of future changes. Our earlier analysis of the role of workplace literacy in labor market achievement of workers pointed out that workplace literacy is closely related to workers' wages earned and employability, indicating that literacy accounts for much of wage advantage and employment stability. We have earlier emphasized that our sample was limited to specialized groups of individuals in two DOL programs which are, to a large extent, targeted upon workers having difficulty finding jobs because of lack of skills or experience or because of workforce dislocations. To the extent that these workers' levels and ranges of economic achievement are unique compared with the general workforce population, estimates of the relationship between the workers' literacy and wages and employment may not correctly reflect this relationship in this general population. At the same time, we have stated that whatever bias may exist is likely to understate the relationship -- i.e., biasing downward the effect of literacy on labor market achievement. If this is true, it is reasonable to think that the importance of workplace literacy is applicable (perhaps to an even greater degree) to the general population of workers.

From the long-range perspective, therefore, a strong argument can be made for inclusion of literacy training in all employment and training programs, accompanied by appropriate program performance standards based upon measuring participants' learning gains in workplace literacy. This type of employment and training approach, oriented both to the short-term goal of returning unemployed workers to jobs and to the long-term goal of ensuring the adaptability of workers to future changes in the labor market, will go a long way toward contributing to sustained economic growth for this country.

CONCLUSION

What Did the 1990 DOL Survey Data Teach Us?

The preceding analysis makes it clear that the 1990 Survey has generated valuable information regarding the literacy status of DOL client populations, the role of literacy in determining unemployed workers' labor market experiences, and the determinants of workplace literacy. An important feature of the survey is that in contrast to the conventional notion of literacy, "workplace literacy" was designed to measure "the range of literacy tasks adults face every day at work, at home, and in their communities."[52] While workplace literacy is measured separately by prose comprehension, document literacy, and quantitative literacy, it is evident that the connecting link among literacy tasks, and hence among the three literacy scales, is the ability to process information and engage in critical thinking. It is this ability that is becoming more and more crucial in today's workplaces in order for workers to perform satisfactorily. The focus on analytical ability, which extends beyond the conventional three R's, makes assessment of job trainees and jobseekers in Department of Labor programs particularly meaningful.

Kirsch, Jungeblut, and Campbell, among others, have shown the extent of the literacy problem among unemployed workers in the JTPA and ES/UI populations -- i.e., that as much as 40 to 50 percent of the participants in these programs have skills considered inadequate in workplace performance.[53] Our study has demonstrated that workplace-literacy proficiency and labor market experience are positively correlated even after we take into consideration the effects of other determinants of wages and employment. Also we have found, not surprisingly, that literacy underlies labor market achievement differences due to occupation, ethnicity, and other factors. In particular, we found that wages and employment are more responsive to workplace literacy among hard-to-employ unemployed workers than among others. Our conclusion is that workplace-literacy training will be an effective tool for enhancing unemployed workers' economic well-being -- not only by easing the job search, but by positively affecting these workers' long-range employment stability.

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[52] Kirsch, Jungeblut, and Campbell, op. cit., p. 4.

[53] Ibid.

Several specific observations and conclusions can be drawn regarding this study's implications for job-training and employment-assistance policy.

A. INTEGRATING WORKPLACE-LITERACY SKILLS IN JOB TRAINING

1. The Need For Workplace-literacy Skills

Data and observations on recent changes in the economy speak powerfully for the need to include workplace-literacy skills training as an integral component of job training. Reasons supporting this argument can be summarized as follows:

(a) Too Many Workers at Low Workplace-literacy Levels

The fact that a very large proportion of unemployed workers in the two Department of Labor programs falls short of the workplace-literacy levels considered necessary to perform adequately in the workplace clearly points to an urgent need for inclusion of literacy training as a part of overall job training. As the report by Educational Testing Service points out, 12 to 13 percent of ES/UI jobseekers and 14 percent of JTPA-eligible applicants in the survey scored at the lowest level of proficiency in the survey assessment. Also, depending on the type of literacy, between 37 and 43 percent of ES/UI jobseekers and between 40 and 51 percent of JTPA-eligible applicants scored at the lowest two levels of proficiency.[54] Since Educational Testing Service experts regard workplace literacy at these levels to be inadequate for satisfactory work performance, and since the survey sample represents as many as 20 million unemployed workers who came through JTPA training and ES/UI employment security systems in a year, these statistics indicate the seriousness of the issue. From this perspective, an emphasis on literacy training is essential in order to fulfill the immediate goal of returning unemployed workers to jobs as well as the long-range objective of assuring continued career growth and employment stability of workers after job training.

(b) Literacy Skills Boost Worker Productivity

Positive correlations between literacy proficiency scores and wage rates strongly support the argument of human capital theory that investment in literacy skills positively affects worker productivity. We infer from the statistical analysis that with high proficiency in literacy, workers can not only perform the requirements of high skill (and high wage) jobs, but can also move about among high skill and high wage occupations because of the flexibility made possible by their literacy skills. This, in turn, facilitates their continuous employment even though particular jobs held may disappear in a dynamic economy.

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[54] Kirsch, Jungeblut, and Campbell, op. cit., pp. 26, 46, and 58.

Thus, from the long-term perspective, literacy training should help a worker experience career growth with fewer interruptions by joblessness.

This point is supported by our finding that the proficiency scores in three scales (especially the prose-comprehension scores) are correlated strongly not only with hourly wages, but also with the numbers of weeks and hours worked during a one-year period preceding the survey. (See Table 1-7.) This indicates that those who are proficient in workplace literacy can command better wages than those who are not and, moreover, that they tend to attain more stable employment. Though this conclusion is tentative at best, since our data are limited to the unemployed workers in two Department of Labor programs, we would suspect that this tendency may be even more intense in the general population of workers. From society's standpoint, this means that literacy training helps maximize utilization of human resources and the output of the economy over time. It is clear that the objective of training should not be limited to placement of workers and short-term earnings gains. Rather, it should also include achievement of long-term income growth and of employment stability. Workplace-literacy training as an ingredient of overall job training and assistance is an indispensable prescription for long-term economic growth and stability.

Our results show that in the JTPA population, literacy is clearly related both to wages and employment. In the ES/UI population, while the role of literacy in determining wages is quite evident, statistical results are rather ambiguous as regards the relationship between literacy and employment. This is because a large proportion of jobseekers in this population (30 percent or more) consists of those who work a full 52 weeks in a year. But, among individuals who work less than a full 52 weeks in a year, weeks worked is much more responsive to variation in workplace literacy than is indicated by our result, which includes all jobseekers in the ES/UI program. Thus, it may be appropriate for the policy focus in regard to effects on employment to be made specifically on those who work less than full time in the ES/UI population, since it is possible that there is a substantive difference between workers in this group and those who work 52 weeks in a year. For example, so-called contingent workers may predominate in this group, while regular workers (who may be on temporary lay-off) may be the majority among those who have worked a full 52 weeks in a year.

(c) Workplace Literacy Is Portable

As against job- or firm-specific skills, workplace literacy represents a "portable skill," which is the essential foundation for acquiring high productivity and high-paying skills. Because employers are expected to be willing to pay for specific skills training but not for general skills training (for fear that the return on their investment in human capital may become naught in the event of training their workers and then losing them to other employers[55]), workplace-literacy training is generally in the domain of society's collective investment. This is akin to investment in public infrastructure (such as highways and bridges), which is in the realm of public responsibility, whereas the purchase of plant and machinery is the responsibility of individual firms. While, clearly, both enhance productivity, the degree of "transportability" of their benefit (or where their benefit accrues) determines where the burden of each type of human capital investment must lie. Inasmuch as workplace-literacy skills are inherently general, the training in such skills is a proper area of government-sponsored job training programs. In addition, to the extent that workplace literacy is the kind of skill needed for the worker to meet and generate creative changes in the economy, this type of training should be the centerpiece of the nation's long-term training strategy. As Lynch has stated:

> The fact that U.S. firms are more willing to invest in firm specific training than in general training is understandable given the inability to "capture" the returns on investments in general training. However, whether or not U.S. firms will be able to remain competitive with this strategy in the future, given the characteristics of the new entrants into the workforce and the skill demands of new technology, is questionable.[56]

(d) Literacy Lessens Differences by Race

Our analysis has uncovered that while there are large wage and earnings differences between whites and blacks and between whites and Hispanics, a substantial portion of such wage gaps and earnings gaps is explained away once the effects of workplace literacy are taken into account. As Tables 1-11 through 1-16 in Chapter I show, once literacy proficiency score is entered into our analysis the white-black gap in wage rate, weeks worked, and total hours worked during the one-year period before applying for training or for jobs at the Employment Service, narrows considerably. For example, when literacy score is excluded from the multiple regression analysis, wage rates, weeks worked, and hours worked of blacks in the ES/UI program are 8, 38, and 15 percent less, respectively, than their white counterparts. These differences shrink to 4, 25, and 2 percent, respectively, when literacy score is taken into account. Table C-1 summarizes these differences.

Effects of literacy on differences by race in wage rate and employment stability, measured in terms of weeks and hours of work, are quite evident from this table. (For the white-Hispanic difference, compare the figures for whites and Hispanics.) It is evident from this table that the improvement in the workplace literacy skills among the minority

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[55] On this point, see, for example, Lisa M. Lynch, op. cit., pp. 29-30.

[56] Lynch, op. cit., p. 6.

Table C-1: Effects of Literacy on White-Black and Hispanic-Black Gaps[+] in Wage Rate, Weeks Worked, and Hours Worked in One Year -- Prose Comprehension

	Controlling Literacy			Not Controlling Literacy		
	Wage Rate (%)	Weeks (%)	Hours (%)	Wage Rate (%)	Weeks (%)	Hours (%)
White:						
ES/UI	4.3	25.0*	2.1	8.3*	38.4*	15.2*
JTPA	.5	4.8	27.0*	1.3	17.0*	40.3*
Hispanic:						
ES/UI	6.5*	4.3	-3.5	8.3*	2.4	-.8
JTPA	16.6*	21.8	36.5*	16.6*	18.9	32.8*

[+] Figures indicate percentages by which the values for whites and Hispanics differ from the corresponding figures for blacks.

* Statistically significant values.

Source: Tables 1-11 through 1-16, Chapter I.

workers would have a significant income and wealth-gap reducing effect.[57] Thus, intensified workplace literacy training would be expected to reduce the inequality in income and wealth distributions by enhancing the productivity and employment security of minority workers.

(e) Structural Shifts and Changing Nature of Needed Skills

More and more, this economy needs workers with specialized and, often, sophisticated skills. The fundamental change in economic structure that has been taking place for the last decade or so, and is expected to continue, is characterized by the increased service component in economic activities, the growing share of the information sector, intensified international cooperation and competition, and an accelerated concern for saving energy. Underlying all of these developments is a profound change in the nature of demand for labor in favor of workers with high levels of skill, supported by broad analytical thinking ability at all levels of the workplace hierarchy. For the entire economy to be efficient and productive, it is not enough to have sophisticated and advanced skill capability at the top of the production ladder, but there must be a balanced development in the quality of labor among all workers -- of which the critical-thinking ability is a key factor.

The trend of the rising service component in production is a response to consumer demand for individualized and diversified goods and services, which is a natural outcome of rising income levels. The shift from mass production of a single homogeneous good to limited quantity production of a diversity of goods is an inevitable parallel phenomenon that is made possible largely by advancement in computer software and hardware technology. This kind of change is expected to continue along with the ever-growing information sector.

This structural shift in the economy has resulted in an increasing share of labor intensive (or more accurately, human-capital intensive or knowledge-intensive) sectors relative to physical-capital intensive sectors. It, in turn, offers a growing opportunity for workers with imagination and intellectual rigor to respond readily to social and economic changes, while at the same time it increasingly limits opportunities for those workers deficient in thinking skills. Such desirable traits as imagination and intellectual rigor are almost synonymous with workplace-literacy proficiency, as defined in our survey.

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[57] This result is consistent with the finding of Rivera-Batiz, who studied the relationship between quantitative literacy and employment probability using the NAEP Young Adult Literacy survey data. He found that when quantitative skills are added as an explanatory variable, "race loses most of its power in explaining the likelihood of employment...." Francisco L. Rivera-Batiz, "Quantitative Literacy and the Likelihood of Employment Among Young Adults in the United States," The Journal of Human Resources, XXVII-2, p. 326. At the same time, it is important to recognize that the barriers facing minority workers which limit their expected income stream tend to reduce the incentive to pursue schooling. The resulting vicious circle of limited opportunities, lack of schooling hence, literacy proficiency, and limited economic achievement has to be broken if the remaining gap is to be narrowed further.

The rapidly-growing service sector, which is the centerpiece of this structural shift, is associated with the corresponding growth of the nation's output. Just as in the manufacturing of tangible goods, the value-added generated by service-sector labor obviously is very much a part of the economy's total output. In addition, because service often functions as a sort of lubricant in the productive activities of other economic sectors, its growth facilitates an increase in the production of tangible goods. In this changing economic environment, there will be a continuing rise in the demand for the workforce to support this sector so that sustained economic growth in today's dynamic economy can be assured. This presupposes sophisticated labor with a high human capital content, including as an important part workplace-literacy proficiency. Inevitably, the employment opportunities for those lacking this kind of proficiency are bound to shrink. Such a trend makes it imperative for training programs to place emphasis on workplace-literacy skills training.

(f) High Job Skills Demand High Workplace-literacy Skills

High level job-specific skills go hand in hand with a correspondingly high level of literacy skills. While workers must have specific skills to perform most jobs associated with high productivity, high wages, and steady employment, the greater the sophistication of these specific skills, the greater the likelihood of the corresponding requirement for literacy skills. In other words, the "portable skill" content of the job skill is likely to increase as the complexity of specific skills increases. For example, compared with a typist's job, word processing requires understanding of a user's manual and even some computer knowledge -- skills impossible to attain unless one has the ability to read and comprehend instructions.

The relevance of this point may be gleaned from our findings in Chapter I with respect to the relationship between occupations and the three measures of market achievement among ES/UI jobseekers, of whom a substantial part are experienced workers. The pertinent part is reproduced on Table C-2, together with comparison findings for the JTPA population. The table shows that the advantage associated with high skill occupations tends to diminish once the effect of literacy is controlled. Among the ES/UI jobseekers, for example, Technical and Administrative occupations are associated with a 26-percent higher wage than Laborer -- when we do not take into account the difference in the literacy levels of these two groups. When we control for the effect of literacy by including the proficiency score in the regression analysis, this advantage diminishes to 22 percent. Consequently, it appears that 4 percentage points of the 26-percent advantage associated with Technical and Administrative occupations over Laborer is attributable to the literacy skill (or general skill) component of specific skills in this occupational group. Similarly, the advantage in terms of the number of weeks of employment, indicating the employment stability of this occupation group, changes drastically from 21 to 13 percent when we recognize the contribution of the workplace-literacy component to this occupational skill. The evidence for other occupations and for JTPA is not as clear-cut because of the heterogeneity within each occupational group and because of the unique nature of the JTPA population.

Table C-2: Effects of Literacy[+] on Occupational Advantage -- Compared with Laborer (Prose Comprehension)

	Controlling Literacy			Not Controlling Literacy		
	Wage Rate (%)	Weeks (%)	Hours (%)	Wage Rate (%)	Weeks (%)	Hours (%)
ES/UI:						
Technical & Admin.	22.0*	13.2*	-1.6	25.9*	21.1*	3.4
Clerical & Sales	2.2	12.8*	-7.0	6.2	17.2*	-4.1
Operative & Craft	5.3	24.0*	15.7*	7.8*	23.9*	15.6*
Service	-16.2*	8.1	-8.6	-10.3*	7.8	-8.6*
JTPA:						
Technical & Admin.	25.4*	6.6	-16.4	11.7*	19.6	-2.2*
Clerical & Sales	1.3	7.6	-8.4	3.2	15.4	-.3
Operative & Craft	9.1*	16.3	18.4*	8.7*	17.7	20.2*
Service	-16.0*	-1.8	-30.6*	-20.7*	-3.2	-31.5*

[+] Figures indicate percentages by which wages and weeks and hours worked in each occupation differ from Laborer.

* Statistically significant values.

Source: Tables 1-11 through 1-16, Chapter I.

2. The Critical Proficiency Level

We have emphasized the need for workplace literacy training in general for the unemployed workers in two DOL client populations. The next question is: "Who should receive literacy training?" Our data indicate that the literacy of the individuals in the study populations is quite variable. For example, prose-comprehension scores range from as low as 101 to as high as 437 (the highest attainable score being 500), with mean and standard deviation of 290 and 50 respectively. Thus, there are at least some individuals whose literacy proficiency is clearly superior, while there are others at the very low end of the proficiency scale; this range indicates diverse needs for workplace-literacy training in the two study populations.

Obviously not every individual in these populations needs literacy training, although most applicants for job training need some type of workplace-literacy training because of clearly inadequate proficiency, such as that evidenced by scores in the low 100s, or because of insufficient literacy proficiency relative to requirements of the jobs aspired to. From the standpoint of making job-training programs efficient, it would be useful to know what literacy proficiency level is a minimum requirement in performing any job in today's workplace.

An example of such an absolute critical level is the current JTPA provision for seventh-grade reading ability as a cut-off in determining training eligibility -- i.e., accept if below this level. The presumption is that reading ability below this level is inadequate for performing in the workplace and requires remedial training. Similarly, Educational Testing Service considers a proficiency at Level 2 or below in the present study to be "very limited" or "inadequate" to perform in the workplace. In both of these actual cases, determination of the absolute critical literacy level is largely intuitive and is not based on such empirical evidence as the association of literacy with wage levels or employment experiences.

The ETS criterion of Level 2 proficiency as the critical level is potentially useful if we can demonstrate that there is a clear break in the increase in wages or weeks worked between Levels 2 and 3, or that wages or weeks worked associated with proficiency below Level 2 are so small as not to reflect full participation in the labor market. The result of a simple statistical analysis of our data to test the first of these premises lends some support to the use of Level 2 of ETS' five categories as the "critical proficiency level." First, as Table 1-1 shows, while the median values of the four indicators of labor market achievement increase progressively with literacy level, with the exception of annual earnings, the transition from Level 2 to Level 3 does not seem to be very dramatic. Moreover, as shown on Table 1-2, the dispersion within each level is very large, indicating a considerable overlap among adjacent levels. Thus, at best, the way these economic indicators are distributed over the five literacy classes seems to lend a rather weak support to the idea of Level 2 being the critical level.

Secondly, however, this situation seems to improve somewhat if other determinants of wages and employment are controlled. Table C-3 shows the result of a regression analysis that holds constant the effects of gender, marital status, race, occupation, achievement of a high school diploma, number of years in the labor force, household income, welfare-payment receipt status, Statewide average pay, and State unemployment. Here, we can see that among ES/UI jobseekers, there tends to be a clear break in the way hourly wages increase between Levels 1 and 2 in terms of document literacy and quantitative literacy, on one hand, and between Levels 2 and 3 in terms of prose comprehension, on the other. For the JTPA population, changes in wages are significant only for document literacy; and a break between Levels 1 and 2 is evident. In terms of weeks worked, the results for the JTPA population indicate a significant gap between Levels 1 and 2. From this analysis, it seems that while the break occurs between Levels 1 and 2 more frequently than between Levels 2 and 3, suggesting that the "critical proficiency" may lie at a score of around 225, ETS' determination of Level 2 (or the score of 275) as the "critical proficiency" may be appropriately conservative from the job training perspective, since in making training available it is better to be inclusive than limiting.

3. Appropriate Workplace Literacy Training

In Chapter II, we examined various factors likely to determine an individual's workplace literacy. The results of that analysis may offer some insight as to appropriate approaches to workplace-literacy training that can be offered in conjunction with job training.

(a) The Importance of Basic Education

We found that schooling is the most important determinant of workplace literacy -- an expected finding given that reading, writing, and arithmetic skills are the basic tools on which one's thinking and reasoning abilities are built. For example, among JTPA males, high school completion means a 34-point advantage in prose-comprehension over those with less than eight years of schooling, while two years or more of college education means an additional 29-point advantage.[58] Taken with our estimate that over 40 percent of JTPA-eligible applicants and more than 20 percent of ES/UI jobseekers have not completed high school, this finding indicates that we must ensure proficiency in the three R's on the part of job trainees before they embark on any workplace literacy and job training so that they can take full advantage of such opportunities. Without these fundamental abilities in reading, writing, and mathematics skills, they would be hard-pressed to develop any critical thinking skills which, in turn, are indispensable in attaining higher level job skills and adaptability to changing job-market conditions.

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[58] See Chapter II, Table 2-8a; and for other groups and literacy scales, Tables 2-8b through 2-10b.

Table C-3: Estimated Net Effects of Literacy on Average Hourly Wage and Weeks Worked (Level I = base)

ES/UI	Hourly Wage			Weeks Worked		
Level	Prose	Document	Quant.	Prose	Document	Quant.
	(%)	(%)	(%)	(%)	(%)	(%)
II	-3.3	10.2*	13.5*	-6.3	-14.7*	-7.3
III	8.2*	9.0*	14.8*	-.7	-6.3	-5.0
IV	16.0*	21.4*	22.1*	3.9	-3.6	-4.8
V	16.5*	.8	33.9*	-.1	10.7	-6.7

JTPA	Hourly Wage			Weeks Worked		
Level	Prose	Document	Quant.	Prose	Document	Quant.
	(%)	(%)	(%)	(%)	(%)	(%)
II	-.1	8.0*	.2	29.9*	15.9*	-5.3
III	5.7	15.9*	4.2	35.0*	21.8*	3.8
IV	-.5	14.1*	4.1	47.9*	38.5*	28.3*
V	41.8*	-2.2	-26.3	54.4*	41.7	-4.3

* Significantly different from zero

Note:
1. Hourly Wage and Weeks Worked are in logarithm.
2. Figures given are regression coefficients for literacy levels with Level I as the reference class.
3. Regression coefficients are multiplied by 100 to indicate the difference in percentage terms.
4. Other variables included in the regression are: Sex, Marital Status, Ethnic Group, Occupation, High School Diploma, Years in Labor Force, Income of Others in Household, Welfare Receipt, Statewide Average Pay (1990), and State Unemployment Rate (1990).
5. Full results of the regression are given in Appendix 3-1.

At the same time, we found that attainment of years of formal schooling or GED does not necessarily guarantee a high level of workplace literacy. In our data, 30 percent of JTPA-eligible applicants and almost 38 percent of ES/UI jobseekers with a high school diploma or GED scored in the lowest two levels in prose comprehension. The picture is much bleaker when it comes to document and quantitative literacy -- i.e., 29 and 38 percent respectively in document literacy and 43 and 47 percent respectively in quantitative literacy. Even the proportion of those with more than a high school education and with scores in these lowest two levels is not inconsiderable.[59] Two explanations may be offered: that these unemployed workers are actually deficient, despite many years of formal schooling, in the reading, writing, and mathematics skills that are a dominant factor in workplace literacy; or that accomplishment in the traditional three R's is not enough to guarantee proficiency in workplace literacy and that the skill to pool together reading, writing, and math skills and apply them to real-life environments must be acquired in addition. If the latter explanation is paramount in this case, then the challenge to designers of job-training programs is to weave training in critical thinking skills with job training and the three R's as a comprehensive strategy for addressing workplace literacy.

While not specifically provided by law, job-specific skills training is offered at JTPA job training sites side-by-side with basic education skills training. The latter includes training in "reading comprehension, math computation, writing, speaking, listening, problem solving, reasoning, and the capacity to use these skills in the workplace."[60] This shows awareness in the employment and training community of the need for literacy training for unemployed workers. However, the apparent absence of system-wide uniformity in the structure and assessment criteria of basic educational skills training suggests that this part of the overall job training program has been given insufficient attention. It seems that in view of the fundamental importance of long-range labor market success of trainees, this part of the program deserves greater emphasis.

Of all the terminees from the JTPA adult and youth program (Title II-A) during the period between July 1, 1991 and June 30, 1992, only 16 percent attained competency in basic education skills and 14 percent attained competency in job-specific skills.[61] Notwithstanding the imprecise nature of these statistics, they do seem to indicate, at least, that there is room for intensifying and adding structure to literacy-skills training in existing job-training programs. Given the important place of "portable skills" training in government-sponsored training programs, as we have discussed earlier, the picture presented by these statistics prompts us to reevaluate priorities in job-training programs.

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[59] Kirsch, Jungeblut, and Campbell, op. cit., Tables 2.1, 2.3, and 2.4.

[60] Employment and Training Administration, SCANS Implementation, September 1991, p. 6.

[61] Source: Employment and Training Administration, U.S. Department of Labor. Admittedly, these numbers reflect information and definition regarding the extent and type of training provided or the actual level of competency attained.

In terms of proximity to the workplace context, the basic education concept in the Job Corps program appears to offer a model approach.

> Basic education, vocational training and social skills training comprise the three tiers of Job Corps training program. Academic instruction is structured to complement the vocational training programs. Reading and math, for example, incorporate related materials from vocational training.[62]

The Job Corps curriculum, which was expanded in 1992, includes an emphasis upon "higher level cognitive skills such as inference and analytical thinking." Two notable characteristics of the Job Corps approach to workplace-literacy training are that the curriculum is well-defined and standardized among all center programs, and that effort is made to measure progress objectively by competency criteria. These are essential requirements for efficiency in the use of training dollars. An interweaving of vocational training and literacy-skill learning in the Job Corps program is evident in the competency standards, learning activities, and outcomes involved in each type of training. This is illustrated on Figure C-1 for training in carpentry and building and apartment maintenance. These two examples from the Job Corps curriculum show a skillful merging of academic learning into the vocational training context.

(b) A Learning Environment Is Critical

Our analysis indicates that the involvement of parents and family in literacy-related activities in early childhood is an important factor in developing literacy proficiency. This result of the analysis points to the crucial role of intergenerational transfer, not only of parents' literacy skills but also of their propensities for learning, their aspirations, and motivations, and any other related attributes which facilitate formation of children's literacy skills. The policy implication is two-fold: literacy levels and the awareness of literacy's importance must be enhanced in the current adult population so that the next generation will have a head start in attaining literacy proficiency, and youth in present job-training and assistance programs must be provided with an environment that emulates favorable family literacy-related practices. This latter point lends strong support to residential programs of training, such as Job Corps, which can be designed to provide immersion in learning experiences throughout the day.

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[62] Employment and Training Administration, SCANS Implementation, September 1991, p. 17.

Figure C-1: **Job Corps Competencies, Learning Activities, and Outcomes* -- Training in Carpentry and Building and Apartment Maintenance**

Competencies	Learning Activities	Outcomes
Carpentry		
Vocational: Ability to lay-out, frame, and erect walls	- Read instructions - Watch demonstration - Practice on mock-up - Work with crew of students to erect a wall - Model skills for other students	Ability to work with diverse group, follow instructions, meet instructor's expectations, negotiate how work can be accomplished, and work cooperatively to finish a project and eventually become a crew leader
Academic: Ability to make a deliberate attempt to look at other people's viewpoints in order to broaden perception of situations	- Read instructions - Engage in small group discussion - Brainstorm - Present a situation to small group - Write situation in journal, requiring looking at others' viewpoints - Pair with another student to critique journal articles	Learning to work with diverse group, understand importance of listening to others' points of view, exercise leadership in small groups, negotiate to arrive at group consensus, and accept constructive criticism

(Figure C-1 continued)

Competencies	Learning Activities	Outcomes
Building and Apartment Maintenance Training		
Vocational: Ability to identify the appropriate tools, equipment, and materials needed for specific jobs in the areas of carpentry, plumbing, electrical, painting, masonry, appliance, heating and air conditioning, and grounds maintenance	- Review orders for maintenance work needed on center - Match jobs to personal training plan - Develop work schedule and make assignments for jobs - Determine tools, equipment, and materials needed for job - Obtain tools, equipment, and materials needed - Work independently or with group to complete maintenance jobs - Return tools, equipment, and materials	Ability to select jobs relevant to personal training plan; estimate the amount of time, number of workers, and tools and materials needed for various maintenance jobs; follow procedures established for obtaining and returning tools; and participate in revision of of those procedures as necessary
Academic: Ability to use course flow charts, CMI, and classroom resources to develop a personal plan for completing each unit/level in a timely manner and for sharing resources (which requires maintaining classroom organization and allocating equipment and instructional materials)	- Use course flow chart and CMI system to set goals, allocate time, and follow schedules - Monitor and update progress using the CMI system - Share materials and maintain organization of resources - Participate in small groups - Distribute work according to group assessment of individual skills	Learning how to manage time, acquire and use materials, allocate shared resources, and provide constructive feedback based upon objective performance evaluation

*Excludes descriptions of competencies in social skills training.
CMI = Computer Managed Instruction.

Source: Office of Job Corps, Employment and Training Administration.

(c) Self-awareness and Periodic Assessments of Literacy Levels

We found that the awareness of one's own literacy level vis-à-vis the levels needed to perform jobs currently held or aspired to is a positive factor in attaining literacy proficiency. Generally, workers who consider their literacy skills to be good enough to perform their jobs tend, in fact, to be more proficient than either those who consider their skills inadequate or do not know whether their skills are adequate or not. At the same time, those who feel they can get better jobs with additional training in literacy-related areas tend to be actually more proficient than those who do not know whether or not they can get better jobs in such a way. What these results indicate may be that one's learning is aided by self-confidence and that self-appraisal and awareness of one's literacy skill level facilitate efficiency in learning.

In either case, these results bring up two relevant points: that it is useful to provide opportunities for each individual job trainee to monitor his or her progress in learning through periodic assessments, and that such assessments should be incorporated into job training programs. As part of the overall workplace-literacy project, Educational Testing Service has created a workplace-literacy testing instrument for the Department of Labor. This instrument is designed so that the score measures the proficiency of the individual test-taker. This newly developed instrument is derived from the pool of assessment tasks used in the 1990 Department of Labor survey as well as in previous NAEP surveys and hence is designed to measure the individual proficiency in each of the three facets (scales) of workplace literacy – i.e., prose comprehension, document literacy, and quantitative literacy. When this instrument becomes available for general use, it will be useful for several different purposes, such as job-training needs determination, job-search counselling, and gauging and tracking the learning gains of job trainees.

(d) Need for Job Analysis

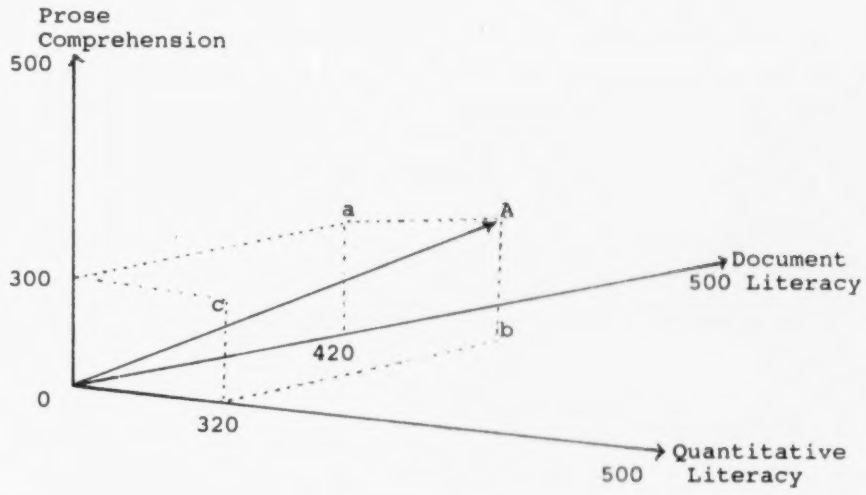
Along with the literacy assessment of job trainees, there is a need to identify the literacy needs of various occupational categories in terms of the same three scales as in individual literacy assessment. Earlier, we discussed the usefulness of knowing "relative" critical levels of literacy. The proficiency score of an individual, obtained using an assessment instrument such as the newly created DOL Workplace Literacy Test, is meaningful only if there is some benchmark with which to compare it. One such benchmark appropriate for jobseekers and job trainees, would be the proficiency requirements of the types of job each individual wants to have -- expressed in a measure comparable to the literacy-proficiency score obtained by the assessment instrument. Such a matching measure of occupational requirements would identify individual training needs vis-à-vis employment objectives. If assessment of a trainee's literacy describes the supply characteristics of labor, identification of the literacy needs of occupational categories describes the demand characteristics. Only when the demand characteristics of desired jobs are known can jobseekers determine whether they are sufficiently equipped for them and make necessary preparations.

It must be stressed here that characterization of jobs or occupational categories in terms of the three literacy scales would result in a very broad grouping of jobs and occupations – quite a different outcome from describing specific jobs in terms of corresponding job-specific skills. A group of jobs with similar literacy requirements is likely to be quite heterogenous in terms of specific skills demanded. We illustrate this occupational characterization graphically by Figure C-2. In this diagram, a group of jobs is represented in a three-dimensional space defined by proficiency scores in prose comprehension, document literacy, and quantitative literacy. Clearly, this is a simplified representation of job requirements, since the requirements of any job are more than three-dimensional; and, in addition to the literacy requirement, specific skills and any other unique requirements add dimensions to the definition of any given job. Clearly, the finer the job classification, the greater the number of dimensions that constitute its definition. Thus, any one point in this diagram is likely to be inclusive of a number of diverse jobs (or is a subset of all jobs) that share the identical requirement in terms of the three literacy scales. Let us refer to it as "job category."

The literacy requirement of a job category is represented by a point, such as point A, in this three-dimensional space defined by three proficiency scores measured from the origin of each axis. Similarly, a position on a line between A and b means that an improvement needs to be made in the prose-comprehension skill. In this manner, each trainee would be given data to decide his or her own literacy needs. In mathematical terms, the literacy requirement of this illustrative job category is a three dimensional "vector" consisting of values -- 300 for prose comprehension, 320 for document literacy, and 420 for quantitative literacy. If a job trainee aspires to a job that falls into this job category, he or she strives to achieve vector A (or achievement of the three literacy levels implicit in A). Any gap between actual proficiency and this vector identifies the area or areas that need improvement in order to realize an employment objective. For example, if proficiency scores place an individual at some point on the line between points A and a, she or he needs to improve in the quantitative literacy skill in order to perform in a job represented by job category A.

We may add that aside from job-specific skills, other general skill requirements add dimensions to the job-category vector. For example, the Job Corps curriculum includes leadership and social skills in addition to the basic educational skill. In this case, the requirement vector of any job category would be five-dimensional. Also, different points on a ray from the origin, indicating different literacy requirements (with proportionate changes in the proficiency of the three literacy areas) may be interpreted to stand for similar occupational categories with varying degree of difficulty -- such as nurses and nurses' aides, technicians and assistants, and so on. It is clear that workplace-literacy assessments of individual trainees and jobseekers, used in conjunction with characterizations of job categories, would be a valuable tool in planning efficient training and job assistance. A strong argument can be made, therefore, for identification of job categories through characterization of jobs in terms of the three literacy scales. It will enhance greatly the usefulness of the individual literacy-assessment instrument.

Figure C-2: **Characterization of Job Categories by Three Types of Workplace Literacy**



(e) Role of Literacy-related Activities at Home and Work

In Chapter II we tested the hypothesis that the use of literacy skills both at home and at work helps to improve these skills even further. Evidence from the analysis is generally consistent with this notion. Literacy-related activities at home were represented in the analysis by the frequency of newspaper reading and the extent of TV watching. Newspaper reading is definitely correlated with literacy proficiency. While the selection issue needs to be taken into consideration, we conclude that this positive association has much to do with the skill-sharpening effect of newspaper reading. The result for TV watching is mixed, with a difference between men and women; nevertheless, it seems reasonable to conclude that a prudent selection of programs can make TV watching a valuable tool for improving one's literacy skills and that the recent phenomenal advancement in electronic technology and media could be exploited to the unemployed worker's advantage in this regard. Our analysis also found that the use of literacy skills at work has a positive impact, and led us to conclude that literacy-related activities both at home and at work have a beneficial effect on one's literacy skills. This result confirms the value of close coordination between basic education and the job-training component of a training program, whereby literacy learning is carried out in the context of skills training. In addition, the finding substantiates the merit of a holistic approach to job training, such as the Job Corps residential program, which aims to teach the student job skills while cultivating social and leadership skills in a controlled environment.

B. WORKPLACE LITERACY AS A PROGRAM PERFORMANCE STANDARD

1. Use of Literacy as a Performance Measure

From the long-run benefit/cost standpoint, an ideal job-training program is one which prepares participants with skills that enable them to perpetuate employment, once they complete training, by parlaying the skills learned in training and post-training placements to secure subsequent jobs (preferably, better jobs at each step). This is a powerful basis for arguing that workplace-literacy training should be integrated into government-sponsored job-training programs. Our analysis of the relationship between proficiency score and various indicators of workers' economic achievement concludes that workplace literacy, through the adaptability made possible by analytical thinking ability, is a causal factor in productivity enhancement as well as in the employment stability of workers .

If workplace-literacy training is made part of job training, then it makes sense to include the literacy learning gains of the trainees in performance standards for evaluating job-training programs. Based on results of the regression analysis in Chapter I, it might even be reasonable to set a target proficiency level to be achieved by a particular training program; the level might correspond, for example, to the level minimally adequate to perform in the workplace -- such as a proficiency score of 275 in each of the three literacy scales. Or, where the initial literacy level is heterogeneous among new trainees, the standard may be set in relative terms (e.g., percentage gains) which would recognize training programs that strive to exceed minimum levels and to accommodate trainee differences in terms of past accomplishments and future literacy aspirations.

Another fundamental reason for using workplace-literacy learning gains as a training-program performance standard is that they also indicate how well a training program helps participants achieve economic well-being in the long run. If we accept that wages and weeks worked represent productivity and employment stability -- and thus indicate the long-range success of workers -- then the strong relationship between these variables and literacy-proficiency scores justifies the use of the latter as a proxy indicator of participants' post-training economic achievement. This is an important role for and a convenient use of literacy assessment, since career achievement of trainees is obviously not directly observable at the point of training completion, and the need for performance evaluation of training sites for operational purposes is immediate. In other words, we cannot afford to wait 10, 20, or 30 years to decide how well a training site is doing in helping its clients.

However, the Department of Labor workplace-literacy assessment instrument created by Educational Testing Service (or any other instrument for forecasting individual labor market success based on the proficiency score and using the results of our analysis of survey data) must be used with care. The extent to which such use is justified depends to a large degree on how accurately the estimated relationship between literacy score and indicators of labor market achievement (e.g., wages and weeks worked) reflects the true relationship. In other words, the ability of an assessment instrument to forecast individual labor market performance ("validity," in testing jargon) is determined not only by large t-scores for proficiency scores in the statistical model of wages or other labor market achievement indicators -- meaning that a large proportion of the variation in earnings, wages, and weeks or hours worked is explained by variation in proficiency score -- but also by the nature and quality of the data used. In the present case this point is important, since such forecasting clearly calls for knowledge of the effects of literacy in general, whereas the populations from which we have drawn samples to estimate relationships consist of unemployed workers who are either disadvantaged and/or dislocated workers, in the case of JTPA, and include a substantial number of entry-level applicants, in the case of ES/UI. This means that observed wages, weeks worked, and hours worked were likely to be concentrated in or even confined to the lower part of the scale. Using such truncated data to estimate relationships between literacy and wages or any other economic achievement indicators, or to forecast a job trainee's labor-market achievement, could produce biased or misleading results.[63]

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[63] As noted in Chapter I, however, we feel that any bias in the regression coefficient in this case is downward-biased, and that analysis for the general population of workers would reinforce our argument regarding the relationship between literacy and economic achievement indicators. In addition, the main focus of our analysis was the description of the two DOL client populations, where generalization of the results was of secondary concern. In the present context we clearly would need precise information about the general relationship between literacy and labor-market achievement indicators. Consequently, it is desirable to adjust for this downward bias by use

2. The "Validity" Issue

In the testing field, "validity" is a fundamental issue raised in regard to any assessment instrument, and we need to address this issue further relative to the DOL workplace-literacy assessment instrument. We interpret "validity" narrowly to mean the degree to which an assessment instrument meets the objective of its use; accordingly, whether or not an instrument is "valid" depends on how it is used. In the use of the DOL assessment instrument in the job-training context described above (i.e., measuring individual learning gains as well as being a tool of program-performance evaluation), the underlying premise is that the instrument predicts individual labor market achievements as a function of workplace literacy. In other words, the validity of the DOL workplace-literacy assessment instrument depends on how well it predicts labor market achievements, as represented by wages and employment, of unemployed workers.

However, workplace literacy is just one of the determinants of an individual worker's hourly wages or of any other indicator of labor market success. Numerous other factors that characterize individual qualifications, backgrounds, and situations affect how well a worker would do in the labor market. These factors include levels of specific skills at varying wages, years of experience in the labor force or on the job, various restrictions impeding geographical and occupational mobility, and institutional constraints preventing workers from being afforded competitive wages and employment opportunities. It is easy to see that in order to evaluate how well literacy proficiency predicts workers' wages and other indicators, the effects of these additional factors need to be held constant. In other words, appraisal of the validity of the DOL workplace-assessment instrument must be made on a "net" basis (net of the effects of other variables). This is the rationale for evaluating the validity of the assessment instrument by a multivariate analysis in which we conclude that literacy "predicts" labor market performance if the coefficient for the literacy-proficiency score is statistically significant.

Deciding at which level of significance one is to conclude that the instrument predicts labor market success requires judgment by policymakers and program administrators based upon the intimacy of their knowledge of job training, its client groups, and the labor market. In our analysis in Chapter I, with only a few exceptions, the regression coefficients for literacy proficiency scores are highly significant (at one percent level or less); and on this basis, we argue that the workplace-literacy assessment score is a suitable proxy measure of post-program labor market achievements of JTPA and ES/UI participants, and should be used for the purposes described above. In addition, we conclude that the

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of appropriate statistical methods. The data from the National Adult Literacy Survey (NALS), a household survey of general population conducted by ETS for the Department of Education, will make a direct estimate of the general relationship possible when they become available.

assessment instrument is valid for predicting labor market achievement of unemployed workers in the DOL programs.[64]

Over time, of course, this rationale of the use of this instrument must be tested against the actual long-range outcomes of individual post-training labor market experiences. Thus we argue that the longitudinal tracking of job trainees and jobseekers should be an integral part of the performance-standard system in job training programs.

C. LITERACY GAPS AMONG SUB-GROUPS

1. Explanatory Factors in Ethnic Differences

As the Chapter II regression analysis indicates, the literacy deficit of minority workers, measured by the ETS assessment proficiency score, is quite large even after controlling for the effects of other relevant variables, such as schooling and other personal and family characteristics. For example, JTPA black males scored as much as 31 points less than their white counterparts in prose comprehension, and JTPA hispanic males scored 24 points less than whites. (See Table 2-8a.) These large remaining ethnic differences in proficiency score may be because there are still other characteristics associated with minority workers that give rise to literacy deficits. For example, quality of schooling -- one such characteristic -- was not included in our analysis. The past disparity in educational expenditures and learning opportunities afforded youth is likely to have resulted in an unequal quality of schools; and, frequently, disadvantaged students have been the victim of poor instruction and inadequate educational facilities. Such variation in the quality of schooling was not represented in the schooling variable in our regression analysis.

Another point which we were not able to consider in this study is the effects of low wages and scarce job opportunities for minority workers (especially disadvantaged youth) -- effects which are likely to discourage these workers from pursuing an education. Given that schooling is a major contributing factor in workplace literacy, it follows that not pursuing it has devastating effects upon the literacy of these workers. The message is that while we need to emphasize improvement of minority workers' literacy levels so that their economic well-being can be enhanced, parallel actions are essential to create incentives for them to better their literacy (with the most obvious action being to eliminate discriminatory barriers in the labor market).

Whatever the underlying factors are in explaining the literacy gap, if substantial deficits in the literacy proficiency of minority workers are indeed explained by these environmental factors, public policy measures need to aim at enhancing these workers' literacy skills through appropriate remedies. Further studies are needed to identify these factors and to help fine-tune public policy.

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[64] The previous critique of our estimation method (see preceding footnote) applies here. In order for test validity to be precise, a model of general relationship needs to be used.

2. The Nature of Assessment Tools and Ethnic Differences

At the same time, the explanation for gaps in proficiency score may lie in the nature of the assessment instrument as well as in the ability of respondents. The words and expressions used in an assessment task (or question) can affect the ability of respondents to answer correctly depending on their familiarity with the language. That is, if respondents do not understand words used or situations portrayed in a question, they have difficulty answering. This issue is particularly relevant in the case of the contextual assessment instrument, in which every individual task is formulated using the events and language of "real life." Since real-life situations are not homogeneously applicable to all or necessarily real to every one in our society, any context from which an assessment item is drawn is bound to be unfamiliar to some segments of the population.

This point is especially pertinent to minority populations, whose culture and language (i.e., words and expressions used) are in many ways different from those of the majority. Since the language and customs of the workplace and real life are oriented to the mainstream of the workforce, the workplace-literacy assessment has to contain items that reflect this fact. This, of course, means that minority workers would be distinctly handicapped in coping with assessment tasks. This is a source of measured literacy-proficiency gaps that have nothing to do with workers' actual literacy skills.

There are two points worth mentioning regarding use of the workplace assessment instrument.[65] On one hand, if the objective of assessment is strictly to measure a respondent's substantive ability in three areas of literacy -- i.e., prose comprehension, document literacy, and quantitative literacy -- proficiency scores of the culture's minority workers would very likely bias true proficiency downward because of workers' disadvantages due to unfamiliarity with the language and contextual situations used in assessment items. In this case, the problem of an observed literacy gap is attributable to the assessment instrument, and the remedy would be creation of an item pool with a large variety of culturally-divergent assessment tasks from which to choose appropriate sets of items to suit particular ethnic or cultural groups.

On the other hand, if the objective of workplace-literacy assessment is to evaluate how well the worker will perform in the workplace, familiarity with language and practices

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[65] The observations made here apply to use of an assessment instrument both in profiling a group (population) and in assessing individual workers. These considerations must be clearly understood in any use of assessment instruments, such as the new DOL workplace-literacy test instrument.

in the workplace itself may be an essential part of performing in the workplace and be considered an added and integral dimension of literacy assessment. In this case, then, ability to understand the language in the "real world" situation used in the assessment task is just as important as the prose-comprehension, document-literacy, and quantitative -literacy skills by themselves; and the measured proficiency score, derived by assessment items geared to the mainstream's workplace culture and language, would be an appropriate measure of the individual's workplace literacy -- notwithstanding potentially unfavorable profiling of minority respondents. Resulting black-white or Hispanic-white gaps would be a basis for arguing for training in the language and culture of the workplace, but at the same time would point to the employers' needs to diversify workplace language and practices in order to create a broader cultural milieu in the workforce and thus to take advantage of otherwise-underutilized human resources. Given that minority populations are projected to be an ever-growing segment of the U.S. workforce, it is imperative to take measures such as those described here to bring down barriers hindering the full productive contributions of minority workers. Also, the sooner these measures are taken, the better for the economy.

3. Older Workers and Workplace Literacy

Additionally, we need to recognize that the points raised in the foregoing discussion are not limited to ethnic minority workers but can be extended to older workers. As workers get older, their employers are increasingly reluctant to make investments in training and retraining. This is understandable given that the return from investment in these human capital resources is likely to occur over a shorter period than if the same investment is made in younger workers. Similarly, a worker's own propensity to invest in himself or herself diminishes with age because of increasing opportunity costs, in time and money. Nevertheless, without training and retraining, it is difficult to keep up with changes in the current language and practices of the workplace; so, in this sense, many older workers are disadvantaged in workplace literacy due to lack of an up-to-date grasp of these changes.

From the standpoint of human resource utilization, the resulting alienation of older workers from the workplace and their withdrawal from the labor force can lead to a serious and unnecessary productivity drain. This is an issue that deserves attention especially today, when people live much longer than they did before and the productive life of workers is being drastically extended. Premature departure of workers from the active workforce results not only in the loss to the economy of their productive contributions but also in the remaining working population having to support them. Thus, it is reasonable to argue for giving serious consideration to workplace-literacy training in conjunction with job training of older displaced workers.

D. SUMMARY

Unemployed workers and how to bring them to productive employment are a primary concern of the Employment and Training Administration. The 1990 Workplace Literacy Survey of the JTPA and Employment Service/Unemployment Insurance populations was prompted by this concern; and we intended to find out the role of the three types of literacy, and the critical thinking ability that underlies them, as a factor in the labor market experience of unemployed workers in these populations.

We did find that literacy (or the lack of it) is a significant problem among these unemployed workers, and that proficiency in workplace literacy played a significant role in determining past wages and employment. From this finding, we infer that improvements in literacy -- especially in the ability to process the information required in contextual literacy -- will increase unemployed workers' chances of finding jobs, getting better wages and, most importantly, attaining career-employment stability and growth. We say this based on the belief that proficiency in literacy and thinking skills makes these workers not only productive but also adaptable to changes in technology and the labor market.

In general, the finding of a positive role for literacy in determining wages and employment supports the idea that improving workers' literacy levels leads to a more productive workforce and, ultimately, a more productive economy.[66] The critical thinking ability, an essential ingredient of workplace literacy, is a source of creativity and prompts workers to perform on the job more efficiently and to find new ways to do things and new things to make life more pleasant. All of this is likely to lead to increases in the economy's output. It is clear, therefore, that the effects of improved literacy proficiency of workers are not limited to a mere reshuffling of income distribution in favor of those who become more "literate"; they also include growth in the size of national output and hence in individual earnings to be divided up among workers.

Approaches to improving the literacy levels of American workers must be fundamental, holistic, and long range. It is not surprising that schooling was found in our analysis to be an important determinant of level of workplace literacy. Clearly, the development of analytical thinking ability presupposes basic skills in the three Rs. The importance of literacy-related activities, both while one grows up and in adult life, points to the need for involvement of home, community, and school in cultivating workplace literacy. Similarly, the significant role of parents' schooling and other literacy-related background characteristics indicates that workplace literacy is the cumulative result of long-range conscious efforts on the part of individuals and their families. We have indicated that the job training of unemployed workers needs workplace literacy as an integral part and that such literacy training should be designed to emulate the kinds of approaches we have outlined.

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[66] This type of pay-off of enhanced workplace literacy can occur at any level of job hierarchy. For example, as a result of workplace-literacy training, a production worker at a Massachusetts manufacturer of temperature and pressure controls and related items invented a simple but ingenious product-cooling mechanism that had a positive impact on company productivity. (From the narrative report of the case studies by Karl O. Haigler and Sondra G. Stein, Workplace Literacy Training in Modernizing Manufacturing Environments, Training and Employment Program, Employment and Social Services Policy Studies, Center for Policy Research, National Governors' Association, Washington, D.C., 1992).

Effective job matching results in efficient use of human resources and in increases in the economy's total productivity. The newly created DOL workplace literacy test (WLT) instrument can be useful in this regard. It will enable job-training sites and employment service offices to assess jobseeker readiness (in terms of the three literacy scales -- prose comprehension, document literacy, and quantitative literacy) for any job sought and to provide appropriate counselling for workplace-literacy training needs. In addition to assessment of individual jobseekers, knowledge of jobs' literacy requirements (in terms of the same three scales) would make this job counselling more precise and effective. Job analysis to categorize jobs by literacy levels would be a highly desirable and useful complement to the WLT instrument.

The 1990 DOL Workplace Literacy Survey has produced a database containing the direct measure of human capital in the form of proficiency scores. In the past, analysis of human capital and its economic impacts had to rely on schooling data. However, schooling is an indicator of the "process" of learning whereas the literacy-proficiency scores the DOL Survey collected are a direct measure of the "substance" of learning, which is what human capital is. Thus, unless used explicitly as an indicator of credentialling effect (independent of learning content), the schooling variable could be misleading. In this sense, the new set of literacy data -- together with another new database, National Adult Literacy Survey (NALS) data on the general population -- should be a welcome addition to the existing database by enabling us to focus more sharply than in the past on the economic effects of human capital.

Finally, this and related analyses of the DOL workplace-literacy survey data offer convincing evidence of the gravity of the literacy problem among unemployed workers in our nation and of the linkage between the workplace literacy and labor market achievement of these workers. On this basis, we point out the need for workplace-literacy training. Obviously, however, for such a recommendation to be ultimately translated into government action, a well-defined program of workplace-literacy training must be formulated, subjected to rigorous analysis of benefits and costs, and explored as to relative advantages among alternative public investments. In this sense, the present analysis is only an initial step in a series of activities, and much additional effort will have to be made to arrive at a meaningful workplace-literacy program as a component of an overall human resource policy.

APPENDIX TABLES AND FIGURES

Table A-1-1: Estimated Percentage Changes in Hourly Wage, Weeks Worked Per Year, and Hours Worked Per Week with One-unit Change in Selected Explanatory Variables -- Regression Results

(a) Hourly Wage:

	ES/UI		JTPA	
Explanatory Variable	Change in Hourly Wage (%)	t-score	Change in Hourly Wage (%)	t-score
Document Literacy Score:	.112	3.803	.109	3.060
Male	17.887	6.987	11.796	4.286
White	3.538	1.082	-1.170	-.320
Hispanic	5.725	1.466	14.306	2.362
Other	4.834	.724	- 7.572	-1.076
Being Married	.552	.224	- 1.382	-.595
Household Size	2.352	3.072	- 4.334	-.555
Technical & Administrative	23.068	4.902	27.271	4.827
Clerical and Sales	3.135	.706	2.691	.579
Operative and Craft	5.833	1.423	9.769	2.434
Service	-15.674	-3.230	-15.359	-3.415
High School Diploma	6.211	2.401	3.442	1.239
Years of Work Experience	2.200	6.786	1.455	3.555
Years of Work Squared	-.039	-4.972	-.021	-1.810
Statewide Average Pay	.002	4.013	.000	1.567
State Unemployment Rate	.286	.205	-3.414	-1.917
Income of Others in Household:				
$ 2,501- 7,500	169.338	3.106	-27.237	-1.011
$ 7,501-12,500	-8.259	-2.613	-7.097	-2.269
$12,501-17,500	-3.968	-1.227	-6.548	-1.738
$17,501-25,000	-4.445	-1.086	4.342	.933
$25,001-35,000	-20.588	-4.164	4.329	.525
$35,001-45,000	-21.118	-3.190	-24.348	-3.853
Not Receiving Welfare	19.786	8.026	13.982	5.069
Constant Term	502.526	30.904	567.615	28.716
Adj R^2	.274		.213	

(Table A-1-1 continued)

	ES/UI		JTPA	
Explanatory Variable	Change in Hourly Wage (%)	t-score	Change in Hourly Wage (%)	t-score
Quantitative Literacy Score:	.121	3.952	.050	1.500
Male	16.972	6.637	11.567	4.191
White	3.059	1.082	1.391	.388
Hispanic	5.850	1.466	14.824	2.436
Other	4.144	.724	-6.004	-.853
Being Married	.517	.210	-.818	-.314
Household Size	2.173	2.849	-.602	-.820
Technical & Administrative	22.368	4.748	27.849	4.849
Clerical and Sales	2.153	.483	3.729	.798
Operative and Craft	5.329	1.304	10.373	2.574
Service	-16.414	-3.392	-15.251	-3.377
High School Diploma	5.691	2.178	5.005	1.793
Years of Work Experience	2.155	6.637	1.592	3.904
Years of Work Squared	-.039	-4.962	-.027	-2.295
Statewide Average Pay	.002	3.980	.000	1.469
State Unemployment Rate	.264	.189	-3.512	-1.963
Income of Others in Household:				
$ 2,501- 7,500	169.059	3.103	-22.982	-.851
$ 7,501-12,500	-8.234	-2.606	-7.321	-2.330
$12,501-17,500	-3.106	-.960	-7.031	-1.862
$17,501-25,000	-4.088	-1.001	4.768	1.021
$25,001-35,000	-20.711	-4.191	4.023	.486
$35,001-45,000	-19.804	-2.990	-24.152	-3.791
Not Receiving Welfare	19.006	7.669	13.864	5.006
Constant Term	503.172	31.341	582.342	28.716
Adj R^2	.275		.208	

(Table A-1-1 continued)

(b) Weeks Worked:

	ES/UI		JTPA	
Explanatory Variable	Change in Weeks Worked (%)	t-score	Change in Weeks Worked (%)	t-score
Document Literacy Score:	.000	-.002	.345	3.366
Male	-3.156	-.529	29.870	3.544
White	-3.207	-.409	5.064	.491
Hispanic	-2.512	-.272	-7.021	-.402
Other	-15.870	-1.017	14.385	.701
Being Married	16.012	2.776	14.257	1.830
Household Size	-2.169	-1.270	-1.866	-.831
Technical & Administrative	3.905	.351	-18.522	-1.131
Clerical and Sales	-8.601	-.818	8.303	.593
Operative and Craft	6.687	.685	11.652	.947
Service	.734	.064	-6.030	-.452
High School Diploma	8.755	1.443	10.911	1.370
Years of Work Experience	.810	1.073	-2.058	-1.806
Years of Work Squared	-.043	-2.433	.014	.454
Statewide Average Pay	-.005	-3.699	.002	.797
State Unemployment Rate	-3.611	-1.108	-17.360	-3.300
Income of Others in Household:				
$ 2,501- 7,500	-246.883	-3.158	-244.969	-6.081
$ 7,501-12,500	-4.214	-.566	-.831	-.088
$12,501-17,500	-4.358	-.569	-12.651	-1.122
$17,501-25,000	-25.456	-2.673	-18.975	-1.410
$25,001-35,000	16.104	1.354	58.348	2.173
$35,001-45,000	-132.962	-9.413	-110.972	-6.221
Not Receiving Welfare	46.596	8.056	67.311	8.142
Constant Term	435.261	11.207	187.103	3.064
Adj R^2	.122		.140	

(Table A-1-1 continued)

Explanatory Variable	ES/UI		JTPA	
	Change in Weeks Worked (%)	t-score	Change in Weeks Worked (%)	t-score
Quantitative Literacy Score:	.023	.315	.238	2.478
Male	-3.286	-.550	28.164	3.393
White	-4.134	-.523	9.693	.956
Hispanic	-2.453	-.266	-4.797	-.274
Other	-16.132	-1.033	16.495	.803
Being Married	15.904	2.757	15.406	1.978
Household Size	-2.159	-1.267	-2.216	-.978
Technical & Administrative	3.640	.326	-19.158	-1.156
Clerical and Sales	-8.901	-.845	8.934	.635
Operative and Craft	6.866	.704	12.077	.978
Service	.797	.070	-7.679	-.573
High School Diploma	8.218	1.338	13.098	1.632
Years of Work Experience	.797	1.054	-1.936	-1.694
Years of Work Squared	-.043	-2.409	.006	.200
Statewide Average Pay	-.005	-3.701	.002	.726
State Unemployment Rate	-3.562	-1.093	-17.883	-3.390
Income of Others in Household:				
$ 2,501- 7,500	-247.194	-3.162	-248.566	-6.159
$ 7,501-12,500	-4.076	-.548	-1.693	-.179
$12,501-17,500	-4.259	-.555	-14.306	-1.267
$17,501-25,000	-25.601	-2.690	-18.641	-1.382
$25,001-35,000	16.053	1.350	57.016	2.118
$35,001-45,000	-132.792	-9.394	-110.889	-6.188
Not Receiving Welfare	46.408	7.991	67.765	8.179
Constant Term	429.771	11.164	218.439	3.660
Adj R^2	.129		.137	

(Table A-1-1 continued)

(c) Total Hours Worked Per Year:

	ES/UI		JTPA	
Explanatory Variable	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Document Literacy Score:	-.051	-.785	.385	3.466
Male	7.623	1.367	32.809	3.625
White	5.445	.742	13.992	1.253
Hispanic	-16.024	-1.846	12.543	.674
Other	-7.783	-.538	14.121	.625
Being Married	1.624	.299	10.984	1.313
Household Size	-2.281	-1.415	-3.671	-1.529
Technical & Administrative	-4.713	-.451	-57.495	-3.254
Clerical and Sales	-21.937	-2.237	-19.774	-1.316
Operative and Craft	1.157	.127	6.333	.482
Service	-23.189	-2.170	-45.725	-3.185
High School Diploma	13.618	2.399	2.531	.295
Years of Work Experience	.629	.891	-1.761	-1.435
Years of Work Squared	-.040	-2.378	.001	.035
Statewide Average Pay	-.003	-2.097	.000	-.346
State Unemployment Rate	-1.305	-.424	-11.550	-2.016
Income of Others in Household:				
$ 2,501- 7,500	-239.986	-3.323	-218.967	-5.058
$ 7,501-12,500	-11.105	-1.573	5.651	.560
$12,501-17,500	-4.752	-.659	8.939	.735
$17,501-25,000	-24.357	-2.746	-38.258	-2.623
$25,001-35,000	7.582	.681	24.694	.850
$35,001-45,000	-78.726	-6.025	-40.357	-2.119
Not Receiving Welfare	18.941	3.498	54.171	6.060
Constant Term	425.841	11.783	255.538	3.901
Adj R^2	.092		.120	

(Table A-1-1 continued)

Explanatory Variable	ES/UI		JTPA	
	Change in Hours Worked (%)	t-score	Change in Hours Worked (%)	t-score
Quantitative Literacy Score:	-.075	-1.110	.261	2.514
Male	8.228	1.473	31.601	3.488
White	6.440	.871	19.432	1.772
Hispanic	-16.209	-1.867	15.087	.809
Other	-7.200	-.497	17.117	.756
Being Married	1.694	.313	12.449	1.489
Household Size	-2.242	-1.393	-4.092	-1.705
Technical & Administrative	-4.192	-.401	-57.948	-3.238
Clerical and Sales	-21.264	-2.162	-18.830	-1.245
Operative and Craft	1.230	.135	6.972	.528
Service	-22.824	-2.141	-47.1621	-3.272
High School Diploma	14.380	2.499	5.015	.579
Years of Work Experience	.661	.935	-1.630	-1.323
Years of Work Squared	-.040	-2.403	-.008	-.221
Statewide Average Pay	-.003	-2.100	.000	-.420
State Unemployment Rate	-1.324	-.430	-12.083	-2.103
Income of Others in Household:				
$ 2,501- 7,500	-238.966	-3.310	-222.706	-5.133
$ 7,501-12,500	-11.199	-1.587	4.573	.452
$12,501-17,500	-5.089	-.705	7.006	.576
$17,501-25,000	-24.317	-2.744	-37.846	-2.588
$25,001-35,000	7.755	.697	22.959	.789
$35,001-45,000	-79.294	-6.066	-40.229	-2.103
Not Receiving Welfare	19.348	3.559	54.750	6.109
Constant Term	430.654	12.004	291.139	4.547
Adj R^2	.092		.117	

Table A-1-2: Comparison Of OLS and Tobit Regression Results -- Percentage Changes in Weeks Worked

Explanatory Variable	OLS(ES/UI) Change in Weeks Worked (%)	OLS(ES/UI) t-score	Tobit(ES/UI) Change in Weeks Worked (%)	Tobit(ES/UI) t-score
Prose Comprehension	.182	4.742	.191	4.758
Male	2.162	.737	2.922	.802
Being Married	6.893	1.891	6.966	1.824
High School Diploma	6.556	1.515	6.854	1.511
Years of Work Experience	.953	2.051	9.239	1.897
Years of Work Squared	-.029	-2.793	-.029	-2.643
Statewide Average Pay	-.005	-5.803	-.051	-5.606
State Unemployment Rate	.022	.010	.036	.016
Not Receiving Welfare	50.054	11.508	51.805	11.350
Constant Term	336.165	14.282	331.937	13.461

Explanatory Variable	OLS(JTPA) Change in Weeks Worked (%)	OLS(JTPA) t-score	Tobit(JTPA) Change in Weeks Worked (%)	Tobit(JTPA) t-score
Prose Comprehension	.458	6.842	.551	6.764
Male	27.280	4.468	34.172	4.622
Being Married	10.467	1.692	11.363	1.515
High School Diploma	13.274	2.033	14.238	1.795
Years of Work Experience	-1.172	-1.440	-1.672	-1.697
Years of Work Squared	.002	.082	.008	.315
Statewide Average Pay	.003	1.711	.003	1.481
State Unemployment Rate	-11.736	-2.689	-13.934	-2.631
Not Receiving Welfare	69.566	11.409	80.910	10.975
Constant Term	92.194	1.924	57.229	.986

Table A-1-3(a): Levels of Proficiency - A General Description

LEVEL 1: Less Than or Equal to 225 on the Literacy Scales

Tasks falling within this range on the three literacy scales are the least demanding in terms of what a reader must do in order to produce a correct response. In general, prose and document tasks at this level require a reader to identify and enter information from personal knowledge or to locate a piece of information in which there is a literal match between the question and the stimulus material. If a distractor or plausible answer appears in the stimulus material, it tends to be located away from where the correct information is found. Although no quantitative tasks used in this assessment fell within this level, experience suggests that such tasks would require the reader to perform a single, relatively simple arithmetic operation (such as addition or subtraction) for which either the numbers are already entered onto the document and the operation is given or the numbers are provided and the operation does not require the reader to borrow or carry.

LEVEL 2: 226-275 on the Literacy Scales

Prose and document literacy tasks falling within this range are more varied in terms of the demands placed on readers. Some of these tasks still require the reader to locate and match on a single literal feature of information; however, these tasks tend to occur in materials in which there are several distractors or where the match is based on synonymous or text-based inferences. Prose and document tasks at level 2 also begin to require readers to integrate information by either pulling together two pieces of information or by comparing and contrasting information. Quantitative tasks at this level typically require the use of one arithmetic operation based on numbers that are either stated in the question or easily located in the document through a literal one-feature match. Moreover, the operation needed to complete the task is either stated in the question or easily determined based on the format of the problem — for example, entries on a bank deposit slip or on an order form.

LEVEL 3: 276-325 on the Literacy Scales

Prose tasks at this level tend to require the reader to search fairly dense text for literal or synonymous matches on the basis of more than one feature of information or to integrate information from relatively long text that does not contain organizational aids such as headings. Document tasks at this level tend to require the reader to integrate three or more features of information from rather complex tables or graphs in which distractors are present in the same row or column. What appears to distinguish quantitative tasks at this level is the fact that two or more numbers or quantities needed to solve the problem must be identified from various places in the material. Also, the operation(s) needed to complete the task is typically determined from arithmetic relation terms in the question, such as "How many" or "What is the difference."

LEVEL 4: 326-375 on the Literacy Scales

Tasks in this range continue to demand more from the reader. Not only are multiple-feature matching and integration of information from complex materials maintained, the degree of inferencing required by the reader is also increased. Tasks at this level include conditional information that must be taken into account by the reader in order to integrate or match information appropriately. Quantitative tasks at level 4 tend to require two or more sequential operations or the application of a single operation where either the quantities or the operation must be determined from the semantic information given or from prior knowledge.

LEVEL 5: 376 and Higher on the Literacy Scales

Tasks falling within this range tend to place the greatest demands on the reader. Typically, they require the reader to search for information in dense text or complex documents containing multiple plausible distractors, to make high text-based inferences or use specialized background knowledge, as well as to compare and contrast sometimes complex information to determine differences. Similarly, the quantitative tasks at this level require the reader to disembed features of a problem from various parts of a stimulus or to rely heavily on background knowledge to identify both the quantities and the operations needed to complete a task successfully.

Source: Irwin S. Kirsch, Ann Jungeblut and Anne Campbell,
Beyond the School Doors, p. 67.

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Table A-1-3(b): Levels of Proficiency by Literacy Area

Prose Literacy

Levels	Description of Prose Tasks at Each of Five Levels
Level 1 0-225	Prose tasks at this level are the least demanding in terms of what the reader must do to produce a correct response. Typically, tasks at this level require the reader to locate one piece of information in which there is a literal match between the question and the stimulus material. If a distractor or plausible right answer is present, it tends to be located away from where the correct information is found.
Level 2 226-275	Some of the prose tasks of this level still require the reader to locate on a single feature of information; however, these tasks tend to occur in materials where there are several distractors or where the match is based on low-level inferences. Tasks at this level also begin to require the reader to integrate information by pulling together two or more pieces or by comparing and contrasting information.
Level 3 276-325	Tasks at this level tend to require the reader to search fairly dense text for literal or synonymous matches on the basis of more than one feature of information or to integrate information from relatively long text that does not contain organizational aids such as headings.
Level 4 326-375	Tasks at this level continue to demand more from the reader. Not only are multiple-feature matching and integration of information from complex displays maintained, the degree of inferencing required by the reader is increased. Conditional information is frequently present in tasks at this level that must be taken into account.
Level 5 376-500	At this level tasks typically require the reader to search for information in dense text containing plausible distractors, to make high text-based inferences or use specialized background knowledge as well as compare and contrast sometimes complex information.

Document Literacy

Levels	Description of Document Tasks at Each of Five Levels
Level 1 0-225	Tasks at this level are the least demanding. In general, they require the reader to either locate a piece of information based on a literal match or to enter information from personal knowledge.
Level 2 226-275	Tasks at this level begin to become more varied. Some still require the reader to match a single piece of information; however, tasks occur where there are several distractors or where the match is based on low-level inferences. Tasks at this level also begin to require the reader to cycle through information or to integrate information.
Level 3 276-325	Tasks at this level tend to require the reader to either integrate three pieces of information or to cycle through materials in rather complex tables or graphs in which distractor information is present.
Level 4 326-375	Tasks at this level continue to demand more from the reader. Not only are multiple-feature matching, cycling, and integration of information maintained, the degree of inferencing is increased. Cycling tasks often require the reader to make five or more responses with no designation of the correct number of responses. Conditional information is also present and must be taken into account.
Level 5 376-500	Tasks at this level require the most from the reader. The reader must search through complex displays contain multiple distractors, make high text-based inferences, or use specialized knowledge.

Quantitative Literacy

Levels	Description of Quantitative Tasks at Each of Five Levels
Level 1 0-225	Although no quantitative tasks used in this assessment fall within this level, experience suggests such tasks would require a single, relatively simple operation for which the numbers are given and the arithmetic operation specified.
Level 2 226-275	Tasks at this level typically require the use of a single operation based on numbers that are either stated in the question or easily located in the material. In addition, the operation needed is either stated in the question or easily determined based on the format of the problem — for example, entries on a bank deposit slip or order form.
Level 3 276-325	What appears to distinguish tasks at this level is that two or more numbers needed to solve the problem must be found in the stimulus material. Also the operation(s) needed can be determined from arithmetic relation terms.
Level 4 326-375	Quantitative tasks at level 4 tend to require two or more sequential operations or the application of a single operation where either the quantities must be located in complex displays and/or the operations must be inferred from semantic information given or prior knowledge.
Level 5 376-500	Quantitative tasks at this level are the most demanding. They tend to require the reader to perform multiple operations and to disembed features of a problem from stimulus material or to rely on background knolwedge to determine the quantities or operations needed.

Source: Irwin S. Kirsch, Ann Jungeblut and Anne Campbell,
Beyond the School Doors, pp. 26, 46, and 58.

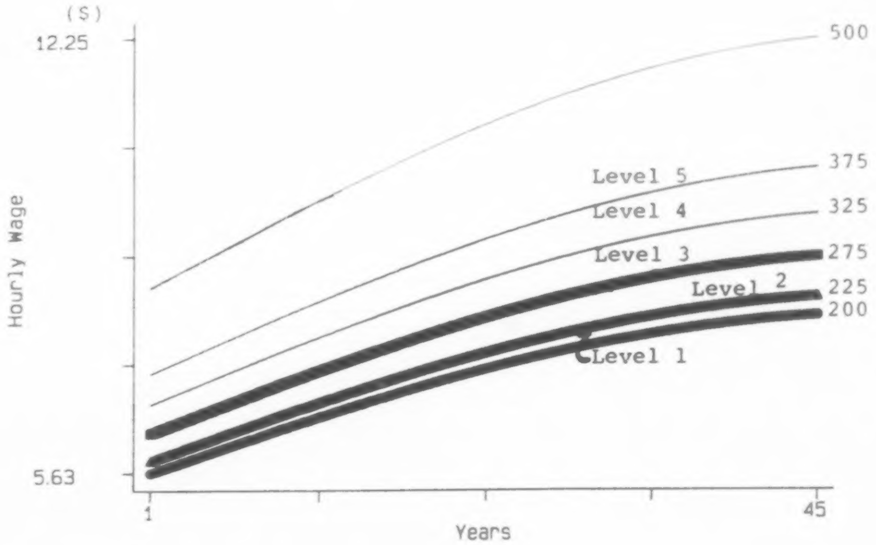
Table A-1-3(c): Difficulty Values of Selected Tasks Along the Prose, Document, and Quantitative Literacy Scales

Scale	Prose		Document		Quantitative	
0	149	Identify country in short article	69	Sign your name	191	Total a bank deposit entry
	210	Locate one piece of information in sports article	170	Locate expiration date on driver's license		
	224	Underline sentence explaining action stated in short article	180	Locate time of meeting on a form		
			214	Using pie graph, locate type of vehicle having specific sales		
225	226	Underline meaning of a term given in government brochure on supplemental security income	230	Locate intersection on a street map	238	Calculate postage and fees for certified mail
	250	Locate two features of information in sports article	246	Locate eligibility from table of employee benefits	246	Determine difference in price between tickets for two shows
	275	Interpret instructions from an appliance warranty	259	Identify and enter background information on application for social security card	270	Calculate total costs of purchase from an order form
275	288	Write a brief letter explaining error made on a credit card bill	277	Identify information from bar graph depicting source of energy and year	278	Using calculator, calculate difference between regular and sale price from an advertisement
	304	Read a news article and identify a sentence that provides interpretation of a situation	298	Use sign out sheet to respond to call about resident	308	Using calculator, determine the discount from an oil bill if paid within 10 days
	316	Read lengthy article to identify two behaviors that meet a stated condition	314	Use bus schedule to determine appropriate bus for given set of conditions	321	Calculate miles per gallon using information given on mileage record chart
			323	Enter information given into an automobile maintenance record form	325	Plan travel arrangements for meeting using flight schedule
325	328	State in writing an argument made in lengthy newspaper article	342	Identify the correct percentage meeting specified conditions from a table of such information	331	Determine correct change using information in a menu
	347	Explain difference between two types of employee benefits	352	Use bus schedule to determine appropriate bus for given set of conditions	350	Using information stated in news article, calculate amount of money that should go to raising a child
	359	Contrast views expressed in two editorials on technologies available to make fuel-efficient cars	352	Use table of information to determine pattern in oil exports across years	368	Using eligibility pamphlet, calculate the yearly amount a couple would receive for basic supplemental security income
	362	Generate unfamiliar theme from short poems				
	374	Compare two metaphors used in poem				
375	382	Compare approaches stated in narrative on growing up	378	Use information in table to complete a graph including labeling axes	382	Determine shipping and total costs on an order form for items in a catalog
	410	Summarize two ways lawyers may challenge prospective jurors	387	Use table comparing credit cards. Identify the two categories used and write two differences between them	405	Using information in news article, calculate difference in times for completing a race
	423	Interpret a brief phrase from a lengthy news article	395	Using a table depicting information about parental involvement in school survey to write a paragraph summarizing extent to which parents and teachers agree	421	Using calculator, determine the total cost of carpet to cover a room
500						

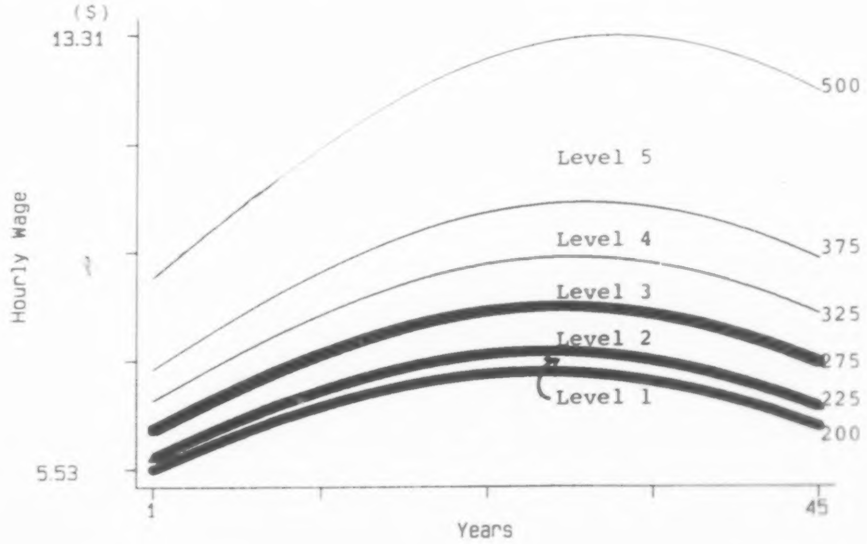
Source: Irwin S. Kirsch, Ann Jungeblut, Lynn Jenkins, and Andrew Kolstad, Adult Literacy in America, p. 10.

Figure A-1: Changes in Hourly Wages Over Years of Work Experience
– Comparison of Various Literacy Levels
(Male, White, Laborer, No High School Diploma)

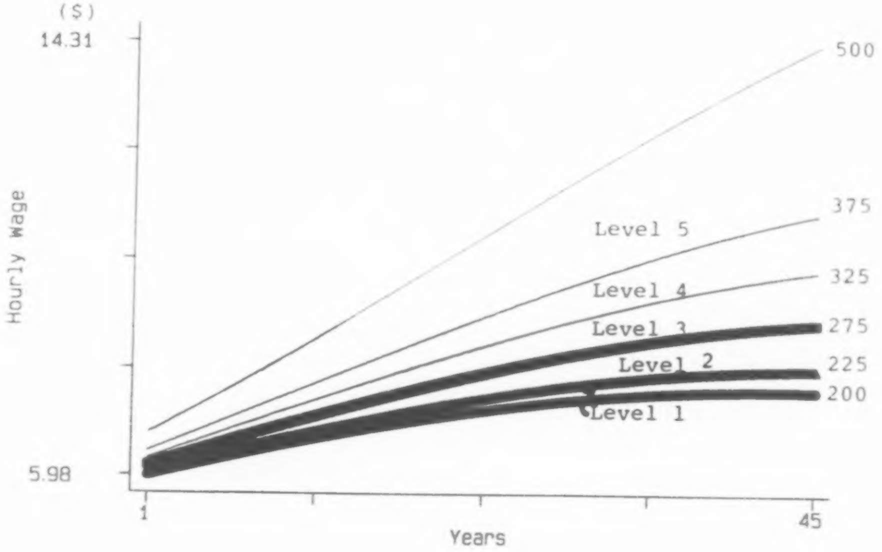
(a) Prose - JTPA



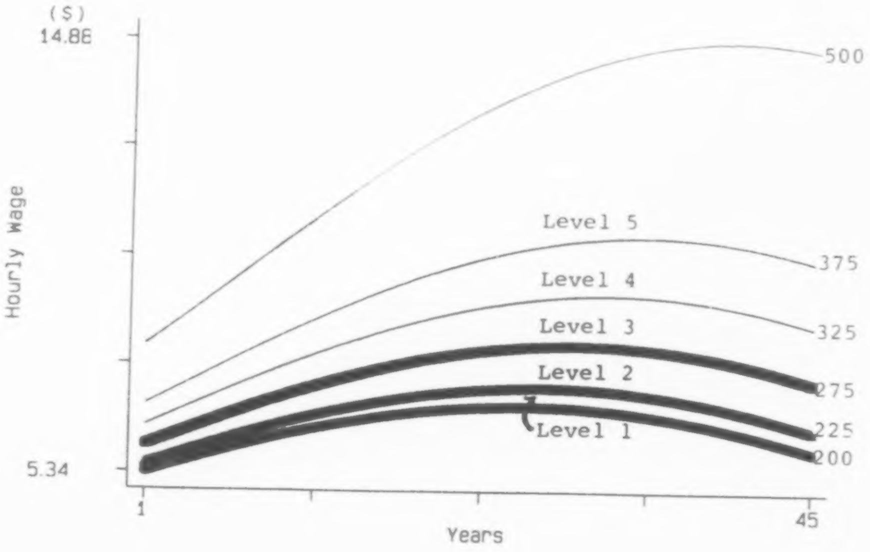
(b) Prose - ES/UI



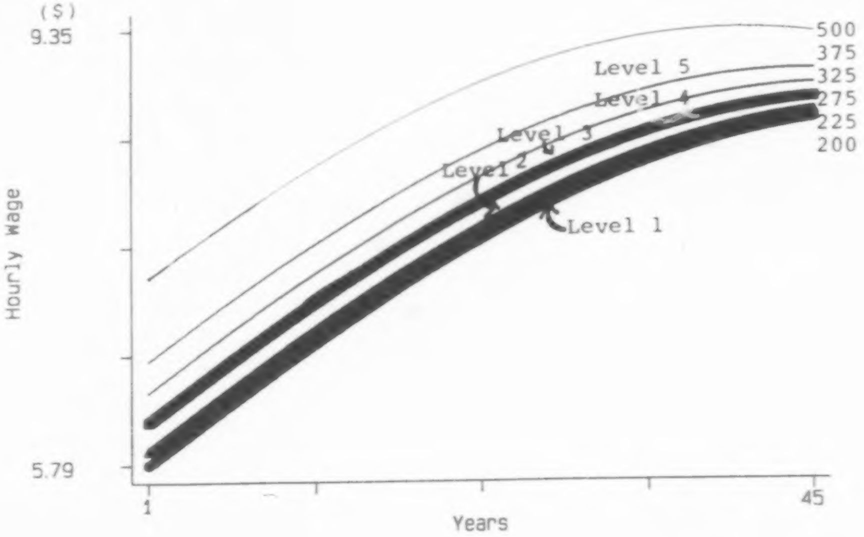
(c) Document - JTPA



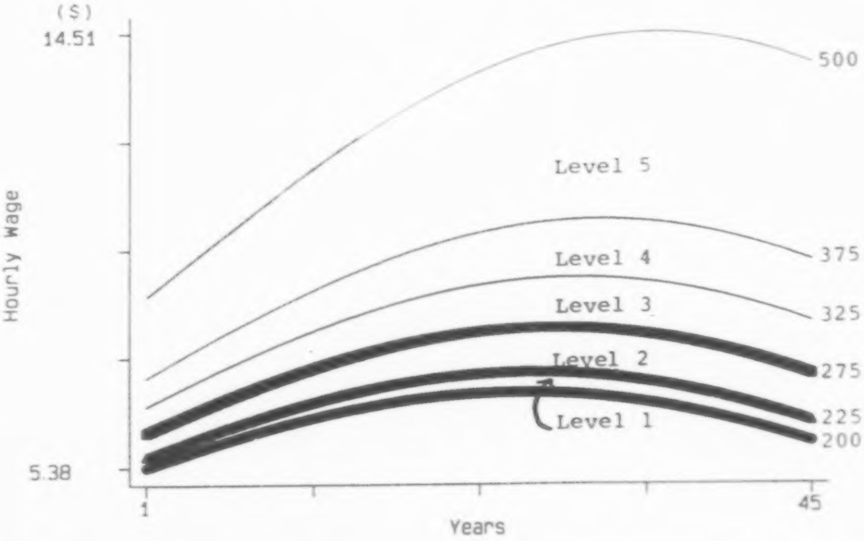
(d) Document - ES/UI



(e) Quantitative - JTPA



(f) Quantitative - ES/UI



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